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Athletic training educators are charged with developing effective pedagogical techniques to ensure students are skillful at critical thinking and clinical problem solving. The purpose of this research was to determine the effects of problem based learning on students' critical thinking (CT) skills and disposition., the relationship between these two constructs, whether disposition predicts skill, as well as students' perceptions of PBL. Two educational methodologies were implemented to assess the effect of PBL on critical thinking (CT) disposition and skill. Thirty-three Kinesiology students participated in this study that included two experimental groups [traditional learning (n=10) and problem-based learning (n=11) sections of ATH 1100 Prevention and Care of Emergencies and Athletic Injuries] and one control group (n=11). Critical thinking dispositions were measured by the California Critical Thinking Disposition Inventory (CCTDI) and critical thinking skills were measured by the California Critical Thinking Skills Test (CCTST). Differences in CT disposition and skill were examined between groups at the beginning, midpoint and conclusion of the semester. Separate repeated measures ANOVAs evaluated groups across time on the CCTDI and CCTST. Results on CCTDI showed that there was a significant group effect ($F_{(2,29)}=3.443$, $p=.046$) and group x time interaction ($F_{(4,58)}=4.620$, $p=.003$). There was no significant difference across time for any group ($p=.871$). Post hoc analyses using main effects testing revealed significant differences between groups at pre test ($p=.007$) and mid test ($p=.044$) but not at post test ($p=.270$) while the TL and control group scores remained unchanged over time. Results also

showed that PBL did not have an effect on Critical Thinking Skill as measured by the CCTST. There was no significant differences between groups ($F_{(2,29)} = .380, p=.687$), across time ($F_{(2,29)} = 1.674, p=.196$) or between groups across time ($F_{(4,58)} = 1.061, p=.384$) on the CCTST. Students in the TL group scored higher on the third written exam ($p=.007$) (the only exam administered after implementation of PBL) than the PBL group, but there was no significant difference between groups on the final lab practical ($p=.392$). CT disposition did not predict CT skill at pre test ($R^2=.001, p=.855$) or post test ($R^2=.014, p=.518$), and there were no correlations found between age, grade level, GPA or SAT scores. However, when an outlier GPA was removed, there was a significant positive correlation between CCTDI and GPA. ($r=.131$). Survey data showed a significant difference between groups in problem solving ability and ability to defend positions. Students in the PBL group self reported that they enjoyed the opportunity to learn on their own, and reported that PBL not only motivated them to learn but also improved their attitude towards learning. Their perceptions of their ability to search for accurate information also improved. The instructor made several observations regarding the learning environment, including the enhancement of students' motivation to learn and their ability to seek out evidence based research. Although there was no statistically significant improvement with PBL, the instructor's observations of students' motivation to learn supports the notion that it can be used as a viable alternative to traditional lecture.

THE EFFECTS OF PROBLEM BASED LEARNING (PBL)
ON STUDENTS' CRITICAL
THINKING SKILLS

by

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To God, who always has a better plan than I do.

APPROVAL PAGE

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CHAPTER I

INTRODUCTION

Statement of the Problem

Athletic training professional preparation has undergone tremendous change over the past two decades. The elimination of the internship route to certification was the first major modification to education. The mandate of obtaining a degree from an athletic training education program (ATEP) accredited by the Commission on Accreditation of Athletic Training Education (CAATE) in order to qualify for the National Athletic Trainers' Association Board of Certification (BOC) examination was necessitated by the elimination of the internship route. Another significant change occurred in January of 2006, with the publication of the 4th edition of the Athletic Training Educational Competencies.¹ This document is intended to guide educators in structuring didactic and clinical experiences for education programs.¹ The 4th edition includes cognitive and psychomotor competencies along with newly revised comprehensive clinical proficiencies that combine the analysis and synthesis of information with the application of clinical skills in patient care situations. The clinical proficiencies are designed to prepare future athletic trainers to critically think in a variety of employment settings and ultimately be able to effectively manage patient care situations. Therefore, athletic training educators are charged with developing effective pedagogical strategies to ensure that students are skillful at critical thinking and clinical problem solving. Critical thinking

(CT) has been briefly explored within the context of athletic training education.

Approximately a decade ago, researchers determined that educators fostered more CT in their learning objectives and written assignments than in their written exams.² It was recommended that educators provide ample opportunities for development of CT skills through various instructional activities.²

Critical thinking disposition among undergraduate athletic training students has been investigated and results showed that AT students are inclined toward CT but this tendency is weak.³ Researchers recommended that educators use teaching methods and techniques that facilitate the components of CT.³ However, it is unclear if there is a difference between CT disposition and CT skills; therefore it is important to look at the relationship between these two constructs.

Problem based learning (PBL) is defined as focused, experiential learning organized around the investigation, explanation and resolution of meaningful problems.⁴ It is an instructional method that fosters CT by challenging students to work cooperatively in groups and seek solutions to real world problems.⁵ These problems are designed to engage students' curiosity and initiate learning the subject matter by shifting the focus from the teacher to the student and thus allowing the student to actively participate in the learning process.⁵

PBL has also been investigated as a pedagogical tool in athletic training, however most publications represent anecdotal commentary rather than systematic scientific investigations. Athletic training educators seem to favor PBL as an alternative method of pedagogy to traditional learning (TL).⁶ At NATA Educators' Conferences, educators

have discussed how they have used PBL although few experimental studies have been conducted to examine the effect of PBL on CT in athletic training education.⁷⁻¹⁰

Purpose

The purpose of this study was to examine the effects of PBL on undergraduate students' critical thinking (CT) disposition scores as measured by the California Critical Thinking Disposition Inventory (CCTDI) and critical thinking skills as measured by the California Critical Thinking Skills Test (CCTST). In addition, we aimed to examine the relationship between a student's disposition to critically think and their critical thinking skills scores. We also evaluated course exam scores to determine if there were differences in course content acquisition. Lastly, we administered on line surveys to assess students' perceptions of the effect of PBL on CT and problem solving skills. Participants were enrolled in ATH 1100A or ATH 1100B, Prevention and Care of Emergencies and Athletic Injuries course and were pre-athletic training majors and exercise and sport studies majors. This convenience sample was chosen because of the number of students enrolled in this course as well as the ability to simultaneously teach two sections of the course in the same semester.

Hypotheses

The following questions were addressed:

Research Question 1: What is the effect of PBL on critical thinking disposition and skill in undergraduate pre-athletic training and exercise and sport studies majors?

Hypothesis 1: There will be no difference in groups between pre to mid point testing scores on the CCTDI.

Rationale: Since there is no intervention, there is not expected to be a difference between groups.

Hypothesis 2: After implementation of PBL, scores from mid to post testing on the CCTDI will improve more in the PBL group than the TL and control groups.

Rationale: Research in other professions, such as nursing has shown that PBL is effective in improving critical thinking disposition.¹¹

Hypothesis 3: Critical thinking disposition scores will increase over time regardless of teaching method.

Rationale: There may be a learning effect as a result of students taking the exam three times in the same semester.

Hypothesis 4: There will be no difference in groups between pre to mid point testing scores on the CCTST.

Rationale: Since there is no intervention, there is not expected to be a difference between groups.

Hypothesis 5: After implementation of PBL, scores from mid to post testing on the CCTST will improve more in the PBL group than the TL and control groups.

Rationale: Research in other professions, such as nursing has shown that PBL is effective in improving critical thinking scores.¹²

Hypothesis 6: Critical thinking skills scores will increase over time regardless of teaching method.

Rationale: There may be a learning effect as a result of students taking the exam three times in the same semester.

Research Question 2: Does CT disposition predict CT skills in undergraduate pre-athletic training and exercise and sport studies majors?

Hypothesis 1: There is a positive relationship between the CCTDI and CCTST.

Rationale: Research in nursing shows a positive relationship between critical thinking disposition and critical thinking skills.¹¹

Research Question 3: What are undergraduate pre-athletic training and exercise and sport studies students' perceptions of the effect of PBL on CT and problem solving skills?

Hypothesis 1: Students in the PBL group will perceive a greater improvement in CT and problem solving skills than students in the TL group.

Rationale: Research in nursing shows that students report an improvement in CT and problem solving skills after participation in PBL.^{13, 14}

Definitions of Terms

CAATE – Commission on Accreditation of Athletic Training Education Programs. This agency was established in July, 2005 and became effective on July 1, 2006.

Certified Athletic Trainer- A health care professional that specializes in preventing, recognizing, managing and rehabilitating injuries that result from physical activity. As part of a complete health care team, the certified athletic trainer works under the direction of a licensed physician and in cooperation with other health care professionals, athletics administrators, coaches and parents.¹⁵

Educational competencies-Educational content that students enrolled in a CAATE accredited program must master. The minimum requirements for a student's entry level education.

Clinical proficiencies-A listing of student's clinical training before entering a profession, a set of decision making skills.¹

Critical thinking skill- Critical thinking is actively analyzing, synthesizing, and evaluating the quality of our thinking process.¹⁶ It is thinking about our thinking, being able to defend our thought processes with rational thought.

Operational definition: critical thinking will be defined in this study as the mean score on the CCTST.

Critical thinking disposition-The consistent internal motivation to engage problems and make decisions by using critical thinking.¹⁷

Operational definition: critical thinking disposition will be defined in this study as the mean score on the CCTDI.

Problem based learning – Learning which results from the progressive disclosure of a case study.¹⁸

Limitations

1. A limitation of this study was the number of participants. Enrollment in the course for the fall semester was limited to encourage enrollment in the spring courses
2. The results of the study cannot be generalized to the general population of students. The purpose of this study was to examine in a specific population of pre-athletic training and exercise and sport studies students whether PBL has an effect on critical thinking disposition and critical thinking skills and to also determine if there was a relationship between the two scores.

3. To control for selection bias, students were not aware that there were two different methodologies being employed in the two different sections when they registered for the course. Students may have experienced events during the semester which affected the results; however the researcher cannot control personal situations.
4. There was an inability of the researcher to control for students' prior academic issues such as documented learning disabilities or previous learning strategies that the students have been exposed to.

Delimitations

1. Only undergraduate pre-athletic training, athletic training and sports and exercise studies students served as subjects in this study. Only students enrolled in ATH 1100B received the intervention (PBL).
2. PBL will only be assessed using progressive disclosure cases. This can affect the ability to generalize the results of this study to other methods of PBL.

Assumptions

1. The researcher made the assumption that students made a consistent effort on the CCTDI and the CCTST.
2. The reliability of the CCTDI and CCTST was not calculated for this particular study. The researcher accepted that both exams were valid and reliable based on previous literature.

Independent Variables

The independent variables were the teaching methods that were employed in this study, specifically traditional learning (TL) and problem-based learning (PBL).

Dependent Variables

Critical thinking disposition and critical thinking skill scores were the dependent variables that were examined in this study.

CHAPTER II

REVIEW OF LITERATURE

Purpose of the Review

The purpose of this review is to investigate the literature supporting Problem Based Learning (PBL) as a pedagogical technique and to explain the theoretical basis for PBL. The construct of critical thinking and how PBL can be used as a tool to enhance critical thinking will be explored. Finally, the advantages and disadvantages of implementing PBL cases will be discussed.

Conceptual Framework

Critical thinking (CT) has become a major focus in programs of higher education.¹⁹ In Goals 2000: National Goals for Education Act, the US Congress made critical thinking an outcome for the college graduate citing it as an indicator of success in higher education.²⁰ Institutions of higher education aspire to produce competent graduates who can think critically and make judgments using sufficient evidence and sound reason.¹⁹ In nursing and other allied health professions, where life and death decisions may depend on the individual's ability to make appropriate choices based on sound reasoning, CT is a mandatory outcome.³ Athletic training is an allied health profession that requires students to be able to think critically and make quick rational patient care decisions based on available evidence. These qualities are especially important in a rapidly changing world where athletic trainers are constantly exposed to

new technology and new information. Athletic trainers must therefore be able to adapt to new situations and create novel solutions to problems.^{1-3, 21} Athletic training students are inclined toward critical thinking but this inclination is weak.³ Researchers have encouraged educators to develop strategies to enhance their students' critical thinking disposition and skills.^{2, 3, 22} The NATA Education Council developed the 4th edition of the educational competencies to promote critical thinking skills as well.¹ There is a growing consensus that to develop good critical thinkers, faculty must include the nurturing of the disposition toward CT.¹⁷ Therefore, educators should implement pedagogical techniques to foster critical thinking disposition and to enhance critical thinking skills.

PBL is a pedagogical method that has been used extensively in the medical and allied health professions to teach students how to approach real world problems. PBL is a tool that can be used to enhance CT ability because PBL cases integrate knowledge, critical thinking skills and critical thinking dispositions in ways that are authentic relative to professional practice.²³ Students must think through a problem and make decisions based on sound judgment. Since PBL involves students using critical thinking skills to analyze problems and find solutions, athletic training educators may choose to use this active learning strategy in their classrooms to enhance critical thinking skills.

Theoretical Basis

Learning is a process of constructing new knowledge associated with a current knowledge base.²⁴ The constructivist theory indicates that learning is an active process in which individuals construct new ideas or concepts based upon their current knowledge and past experiences.²⁵ Bruner's classic constructivist theory poses that the learner

gathers information, forms hypotheses and makes decisions using a cognitive framework. This cognitive framework follows that students first understand basic information and then apply those concepts as they progress in the curriculum. It is an active learning theory that holds that students internalize information best when they are directly involved in their own learning. Students learn from the instructor and from each other in an atmosphere of cooperative learning.²⁶ Constructivists believe that humans are insatiable for new information and are driven to comprehend it. Knowledge is constructed, built on previous knowledge and experiences and is continuously evolving.²⁷

This theory aligns well with athletic training education where the concept of “learning over time” is emphasized. This learning over time phenomenon is a process where students learn the basic concepts and then continually build on them to develop competency and ultimately, clinical proficiency. This includes skill performance as well as clinical judgment. The phenomenon requires a close relationship between content which is presented in the classroom (didactic) and content which is practiced in the clinical environment (clinical education). PBL combines both the content knowledge with the application of skills in solving cases.

Critical Thinking

Critical thinking is “purposeful, self regulatory judgement.”²⁸ It is reasonable, reflective, responsible and skillful thinking focused on deciding what to believe or do.²⁹ Critical thinking is also critical inquiry, so individuals can investigate problems, ask questions, discover new information and pose answers that challenge the status quo.²⁹ Students constantly process information and CT is the practice of processing this

information skillfully, accurately and rigorously to allow them to make reliable, logical and trustworthy conclusions.²⁹

The intellectual roots of critical thinking can be traced back to Socrates more than 2500 years ago.³⁰ Socrates encouraged persons to think logically, to question authority and to ask deep questions before accepting ideas as truth; in other words, he encouraged them to think critically.³⁰ He believed that thinking should be based on well thought through foundational assumptions.³⁰ When an individual is able to critically think, they improve the quality of his or her thinking by skillfully analyzing, assessing and reconstructing information.^{16, 30} Teaching students how to critically think prepares them to succeed in the rapidly changing world.²⁹ When athletic training students are good critical thinkers they can explore a situation or problem, such as a patient case, integrate all of the available information and determine the diagnosis and the best course of treatment. Students are able to come to conclusions using rational analysis based on sound arguments.¹²

Research in education indicates that critical thinking does not happen naturally and that students are often taught *what* to think instead of *how* to think.^{31, 32} As evident in the comprehensive clinical proficiencies,¹ athletic training educators need to facilitate the development of students' critical thinking ability by engaging them in active learning activities that integrate decision making and problem solving opportunities.^{1, 33} By fostering critical thinking, students can develop a deeper understanding of clinical concepts which are essential in the clinical problem solving process regarding patient care decisions.

A key component of learning is the development of CT skills. Many students never develop these skills because they were never taught how to critically think, which is a learned ability.²⁹ Even today, most faculty use lecture as the primary source of content delivery.¹⁶ This may be because when they were students themselves they were not encouraged or shown how to develop their own critical thinking skills and therefore do not know how to cultivate these skills in students.³⁴ The use of lecture is a traditional method of teaching (TL) where students are passive recipients of information. Research has shown that lecture is relatively ineffective and that knowledge and understanding are not gained from memorization but must be constructed from critically thinking.²⁹ Memorizing and learning isolated facts is counterproductive when future facts will eventually replace them.²⁹ In a rapidly changing society, students must think critically by asking appropriate questions, gathering relevant information and efficiently sorting through the information to differentiate between knowledge and facts. As educators, developing CT ability lies in creating conditions for participation rather than passivity and in providing opportunities for emotional engagement of the materials. Educators have used such methods as group discussion, small group interaction via problem-based learning, case studies, portfolios, cooperative learning and peer assisted learning to promote critical thinking skills.^{2, 7, 21, 35} Regardless of the approach, the focus should be on actively involving students in the educational process, making them responsible for their own learning.³⁶

Educators need to challenge students to know, not to memorize.¹⁶ They provide the foundation for learning and then allow students to continue to learn independently.¹⁶

Students must be encouraged to reflect on information and not just learn facts. They need to become active learners rather than passive recipients of information, taking responsibility for their own thinking and learning.

To enhance CT, educators must create a culture of inquiry, where it is acceptable to ask questions.¹⁶ Modeling CT skills and actively questioning students' thinking are key components to this process. Students should be challenged to think about what they learn and be able to do so independently.¹⁶ Educators should avoid asking low level questions, those based on memorization and not understanding. They should ask higher order questions, to force students to go beyond the facts and construct a rationale.¹⁶ Critical thinking skills that are originally taught in the classroom must then be transferred to the clinical setting. This transfer of skill is the most important issue in clinical proficiency.

CT has both a dispositional and a skills dimension, in other words, it includes cognitive skills and affective disposition.¹¹ Students that demonstrate a disposition toward CT may have a stronger CT ability.¹¹ An individual's dispositional dimension of CT is consistent with their internal motivation to engage in problem solving and decision making.³⁷ There are seven constructs that experts have determined to be characteristic of individuals who have a strong disposition towards thinking critically. These include inquisitiveness, open-mindedness, systematicity, analyticity, truth seeking, CT self confidence and maturity.³⁷ To further elaborate on these constructs, inquisitiveness measures an individual's intellectual curiosity and their willingness to learn for the sake of learning. When a student demonstrates open-mindedness, they tolerate diversity and

are open to opposing points of view. An individual that is systematic is said to be organized, orderly, focused and diligent in inquiry. When a student is analytical, they are alert to situations that may be problematic and recognizes the need to intervene and when a student displays self confidence, they are certain when making decisions. Another characteristic that demonstrates a strong disposition toward CT is their truth seeking tendencies. When a student is honest and seeks to discover the truth by asking questions and making decisions based on evidence, they are said to be truth seeking. Finally, an individual with cognitive maturity looks “outside the box” to find answers to questions. This individual does not simply see two sides to an issue (i.e. black/white, good/bad) but rather realizes that problems may be more complex.

Measuring Critical Thinking Disposition and Skills

In 1987, the American Philosophical Association (APA) determined there was a need for a clear consensus definition of CT.³⁸ Using the Delphi technique, a facilitator identified 46 CT experts (from Philosophy, Psychology, Education and other physical and social science disciplines) across the United States and Canada and these individuals communicated over two years until a consensus definition of CT was reached.³⁸ The resulting definition describes CT as “purposeful, self-regulatory judgment”.²⁸ Two dimensions of CT evolved from this, the cognitive abilities dimension (CT skill) and the affective (CT disposition) dimension. These dimensions allowed identification of skills and sub-skills that must be developed in order to become a better critical thinker and they also identified characteristics of strong critical thinkers.³⁸

The California Critical Thinking Disposition Inventory (CCTDI) was developed to measure critical thinking disposition and the degree of such disposition.¹¹ An individual's CT disposition is their internal motivation to solve problems and make decisions based on sound reasoning.³ The CCTDI measures the seven constructs of disposition discussed previously³⁷ along with the overall CT disposition score that is computed with equal contributions of each scale.¹⁷ There are a total of 75 items (9 to 12 questions for each scale) that use a likert type scale, with answers (1) disagree strongly, (2) disagree (3) disagree marginally (4) agree marginally (5) agree and (6) strongly agree. For each scale, an individual's score can range from 10-60, for a total possible score for all 7 scales to be 420. A total score of <280 is said to denote a weakness in CT disposition and a total score >350 indicates a strength in CT disposition.^{11, 39} For individual scales, a score greater than 40 is interpreted as a positive inclination to critically think. For scores less than 30, a negative tendency to critically think and a score in between (31-39) an ambivalent inclination.⁴⁰ Alpha reliabilities for the CCTDI scales ranged from .71 to .80.³⁹ The developers of the instrument have also confirmed its' validity. The CCTDI is available in electronic or paper form for a fee from The California Academic Press, LLC.

The consensus definition of CT was the impetus for the development of the California Critical Thinking Skills Test (CCTST).³⁸ The CCTST 2000 is an instrument designed for assessing an individual's CT skills. It has been used by colleges and universities to gather data on individual and group CT skill levels.⁴¹ The CCTST 2000 measures CT through five constructs: interpretation, analysis, evaluation, explanation and

inference.⁴¹ There are 34 multiple choice problems on the test and some questions have 4 choices (a-d) and some have 5 choices (a-e). Some questions are presented with images and diagrams, which is a new feature of the CCTST (Form 2000).

The CCTST reports 6 scores, the overall score and then separate scores for each of the 5 constructs of CT.³⁸ Each item on the CCTST is assigned to one of the three subscales: analysis, evaluation and inference.⁴² Analysis is defined as the ability “to identify the intended and actual inferential relationships among statements, questions, concepts, descriptions or other forms of representation intended to express belief, judgment, experiences, reasons, information or opinions”.²⁸ Evaluation refers to the ability “to assess the credibility of statements or other representations which are accounts or descriptions of a person’s perception, experience, situation, judgment, belief or opinion and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions or questions or other forms of representation”.²⁸ Inference is defined as the ability to identify and secure elements needed to draw reasonable conclusions, to form conjectures and hypotheses; to consider relevant information and to deduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts or descriptions”.²⁸ The analysis scale ranges from 0-7, the evaluation scale ranges from 0-11 and the inference scale ranges from 0-16.⁴³ This score which totals 34 points is the score provided when the scores are tabulated. The other scales, deductive and inductive reasoning range from 0-17 each, for a total of 34 points. Each question in the CCTST can be classified as inductive or deductive reasoning, so that score also totals 34 points.⁴³ Each correct

answer is assigned 1 point, therefore scores can range from 0 to 34, with higher scores reflecting stronger CT ability.¹¹ The researchers established norms on the test from an aggregate sample of 4 year college students updated for the 2002-2003 academic year. The mean score is 16.8 with a range of 1-32, with a standard deviation of 5.062.⁴³ Therefore, scores that fall below the mean are said to translate into weak CT skills and a score greater than the mean translates into stronger CT ability.¹¹ Reliability of the CCTST was established using Kuder Richardson-20 alphas that range from .68 to .70.⁴¹ An achievable level of internal reliability in such instruments is typically regarded to be .65-.75.³⁸ Therefore, the range of .68 to .70 supports its reliability to measure CT skills. Concurrent validity and content validity have also been demonstrated for this instrument.⁴⁴ Construct validity was derived from the American Philosophical Association 1990 Delphi Report. Strong correlations have been reported with college level GPA, SAT verbal and math scores and Nelson-Denny Reading scores which have been used as predictors of freshman level college GPA.³⁸ Form 2000 of the CCTST is the most updated version of this test and includes CT questions that require the application of reasoning skills. The test is available in written copy or via e-testing for a fee from The California Academic Press, LLC.

Being skilled does not necessarily assure that one is disposed to use CT and being disposed toward CT does not assure that one is skilled.³⁷ However, some research has shown a positive correlation between overall disposition toward CT and strength in CT skills.^{37, 45} Educators in nursing have also shown a significant relationship between CT disposition and CT skills.^{11, 45} In one study, the correlation between the CCTDI and the

CCTST was investigated using the Pearson correlation and results showed there was a significant correlation ($r=.305$, $p<0.001$).¹¹ This study also showed a significant difference in disposition and critical thinking skill scores between students enrolled in different programs, specifically associate (ADN), baccalaureate (BSN) and RN-BSN programs.¹¹ Although all students demonstrated weaknesses in CT disposition (mean CCTDI was 263.20 out of 420) and CT skills (mean CCTST was 11.36), the BSN students had higher CT disposition (mean score 267.40) and higher CCTST scores (mean score 13.33) than the ADN and RN-BSN students.¹¹ Another study was conducted in a nursing program in Canada to investigate CT skills and dispositions in baccalaureate nursing students.⁴⁵ The study showed the CT mean scores increased from years 1 to 4 with the exception of year 3 (mean score was 17.4). The mean score for CT disposition was 312.3 out of a possible maximum score of 420. A significant relationship between students' overall CT skills and disposition was found. These studies support assertions that CT skills and dispositions are mutually reinforcing and that there is a relationship between dispositions and skills.

Strong CT ability is the essence of professional practice. Athletic training education programs must produce individuals that are capable of thinking critically, who can analyze a situation and make necessary decisions to effectively solve problems.⁷ Research has shown that athletic training students have relatively weak CT disposition.³ Educators have been challenged to develop pedagogical techniques to facilitate the components of CT.^{3,22} With technological advances, healthcare is rapidly changing and students' success depends not only on the ability to think critically, but also be able to

access current information, critique available resources and apply that information to solve problems.

Problem-Based Learning

Problem-based learning (PBL) is an approach to learning that emphasizes the development of CT skills by using actual patient problems.⁵ Pedagogic emphasis is on the process of learning rather than the cumulative acquisition of factual knowledge.⁴⁶ However, these problems are often purposefully “ill-structured” so there is insufficient information to solve the problem. Therefore, students must analyze the information they have, establish differential diagnoses and identify learning issues that must be researched and answered in order to narrow down the differential diagnoses. They must use this knowledge to request additional information to ultimately solve the problem.⁵

PBL does not refer to a specific educational method.⁴⁷ In fact, some believe that a definitive PBL program does not exist and that PBL is more of a philosophy than a prescriptive methodology.⁴⁸ Consequently, there are many variations to PBL. Considered the originator of PBL, Howard Barrows describes these variations in detail, explaining how faculty can incorporate PBL into their program based on their own resources and needs.⁴⁷ He proposes a PBL taxonomy which ranges from using lecture based cases in a traditional setting to implementing a full “closed loop” problem-based curriculum.⁴⁷

PBL is a pedagogical model that has gained popularity in allied health and medical education. PBL studies have been conducted in fields such as anesthesiology⁴⁹, pharmacology^{50, 51}, dental school programs⁵² and occupational therapy programs⁵³.

Additional studies have been conducted in physical therapy⁵⁴, nursing¹⁴ and athletic training programs.^{7, 55} Several of the studies comparing PBL to TL, have shown that the implementation of PBL does not sacrifice course content. Those studies indicate that PBL is an effective tool that can be used to enhance students' motivation, improve retention of knowledge and develop CT skills.^{7, 13, 53, 56, 57}

Progressive Disclosure Cases

One type of PBL is the use of progressive disclosure cases. Problems are presented as cases in a progressive manner, meaning students are provided with the initial information and must request additional information to ultimately solve the problem. Individuals are typically given the chief complaint or current symptoms, present and past medical history (if available), family and social history, review of systems, physical exam findings, medical history, and/or lab and diagnostic procedures pertinent to the patient.⁵⁸ Students must ask questions, request additional information based on their evaluation of the patient and research information that they need to have in order to solve the problem. Information is therefore progressively disclosed as the students seek to evaluate the problem.^{51, 59} Cases help stimulate CT by requiring students to gather information about the patient, form hypotheses and ultimately apply what they learn to reach a conclusion.

Progression of PBL

The progression of the PBL format is to first explain the process to the students. The facilitator then establishes teams and provides the case to the students, in a progressive disclosure format.⁶⁰ Students define the problem by identifying facts and then brainstorm with each other using their existing knowledge and past experiences.

Students formulate hypotheses and identify learning issues (faculty may choose to assign the learning objectives or ask students to develop their own learning objectives) as a group. Group members divide responsibilities, go and gather research and information and bring it back to present to the group. Students return with their information and apply this newly gained knowledge to the case. They then summarize what has been learned and revisit the hypotheses.⁶⁰ Finally, they identify the possible solution and evaluate the sources and the process. The facilitator, or instructor debriefs the case with the students and generalizes learning to the case.⁶⁰

Successful Implementation of PBL

Success of a PBL program is dependent on the cases used. An appropriate case should present a common situation that graduates would be expected to handle, however it should also have a degree of complexity that is appropriate for the students' prior knowledge.⁶¹ Cases that represent uncommon clinical problems are not recommended because of their complexity.⁵ Second, cases should be structured so that appropriate management might affect the outcome.⁶¹ They should be interdisciplinary and should cover a broad content area. They should be developed to address specific course objectives and should present an actual scenario/problem.⁶¹ Cases should stimulate thinking, analysis and reasoning as well as promote self directed learning while leading to the discovery of learning objectives.⁶² Other characteristics of good cases are the ability to engage students' interest and motivate them to continuously learn and build upon their existing knowledge.⁵ Good cases require students to seek information outside of their textbook, determining what information is relevant and requiring them to justify

their decisions.⁵ A case should be suitable for the process of analysis to be applied.⁶³ Success also depends on learners being responsible, self directed and participatory.⁵⁴ Finally, cases should allow students to not only learn medical terminology but to decipher the language so that they can fully comprehend the case.⁶²

Outcomes of PBL

PBL programs should possess four broad outcomes. First, knowledge should be structured for effective retrieval in clinical contexts.⁴⁷ Education is most effective when students learn how to retrieve information from the basic and clinical sciences and apply what they have learned to future clinical tasks.⁴⁷ In PBL, students use their foundational knowledge to be able to answer questions and support those answers with reasoning.⁴⁷ Second, CT should be fostered by the process of PBL.⁴⁷ Problem solving skills are enhanced through repeated practice and feedback. These skills include identifying the problem, generating hypotheses, identifying learning issues and analyzing options. Students then make decisions based on sound reasoning and judgment, which must be developed while using existing knowledge to ensure that students will develop these skills for work in the clinical setting. Third, effective self-directed learning skills should be developed for continuous learning.⁴⁷ As a self-directed learner, the student can locate and use appropriate learning resources and critique those resources. These skills are necessary in a society where information changes rapidly. Finally, graduates of a PBL program should have an increased motivation for learning.⁴⁷ When students are motivated to learn, they retain information, and learn for the sake of learning.

PBL in Athletic Training Education

Research on the use of PBL in athletic training education is limited. Athletic training educators support the use of PBL as an alternative pedagogy,⁶⁴ and many use forms of PBL in their classrooms.⁶⁵ However, few have conducted experimental research to determine if it is an effective pedagogical technique.¹⁰ The majority of research has been conducted for doctoral dissertations and has not undergone the peer review process of publication.^{10, 64, 65} One study examined the variables that influence athletic training students' attitudes toward PBL and determined that upperclassmen had a more positive attitude towards PBL.⁶⁶ While this study did not objectively measure the effect of PBL on CT and problem solving, the participants perceived that PBL enhanced their CT and problem solving skills. In addition, those athletic training students indicated that self-directed learning was better for retention and they enjoyed working with their peers in PBL groups.⁶⁶ Another study in athletic training implemented PBL in a pharmacology course and found no significant differences between the TL and PBL groups in terms of test performance or in CT ability as measured by the CCTST.¹⁰

Problem Solving Ability and Critical Thinking Skills

Students who acquire knowledge through PBL have enhanced problem solving ability and are able to apply those skills to answer questions.⁶⁷ Several studies have been conducted to determine if this methodology has an impact on problem solving and CT abilities. A PBL course was implemented in an ambulatory care setting for nurses.¹³ Results indicated that students enhanced their knowledge, improved decision making and CT skills as evidenced by a change in values from pre to post test scores (participants

were rated on identification of the problem, solution, resource, ethical solution and ethical theory and each of the areas had a scoring range of 0-5).¹³

To examine the outcomes of PBL programs in nursing schools in South Africa, researchers conducted a qualitative research study using in depth interviews with graduates and their supervisors.¹⁴ They found that the PBL group fared better than the non PBL group in their level of problem solving abilities as perceived by the students working in professional environments.¹⁴

Nursing students at a university in Hong Kong were assigned to either a TL or PBL course in nursing therapeutics for a period of one academic year and their CT disposition was measured four times, at the beginning and end of the two semester course, and at 1 and 2 year follow-ups.⁶⁸ Compared to the TL group, PBL students showed significantly greater improvements in the development of their CT disposition scores as measured by the CCTDI at the end of the academic year, and continued to have higher scores for two years afterwards (but to a lesser degree).⁶⁸

A program of problem-based case study was implemented to enhance CT in nurses.¹² Students enrolled in the program favored the case study approach. Students self reported an improvement in CT skills and problem solving ability on self evaluations.¹² Similar results were reported in a nutrition and dietetics course. Students felt they had developed stronger thinking and problem solving skills, effective communication skills and a sense of personal responsibility than did students that received lectures.⁶⁷

Not all studies report an improvement in problem solving abilities with PBL implementation. Using multiple choice exams and by observing student behaviors, researchers assessed problem solving skills and students' knowledge base during clinical placements in nursing.⁶⁹ The traditional (control) group outperformed the PBL group in all areas except teaching skills, but only at levels that were not statistically significant.⁶⁹

Effect of PBL on Content Knowledge/Retention

Critics believe that content is sacrificed when PBL is adopted; therefore, several studies have examined the effectiveness of PBL versus didactic teaching in basic and clinical science examination performance.^{50, 70-72} In a study of 3rd year medical students, there was no difference found between examination scores using PBL versus a traditional teaching program.⁷¹ Medical students enrolled in a neonatology clinical clerkship using PBL had significantly higher scores on the Objective Structured Clinical Exam (OSCE) and the Multiple Choice Questionnaire (MCQ) compared to incoming students who had not had the neonatal course.⁷⁰ In another study, no significant difference was found in the overall medical board examination scores between medical students enrolled in another PBL curriculum and the students that participated in didactic instruction, however significantly higher scores were reported for the PBL students on several components of an essay examination that measured clinical knowledge.⁷² At a German medical school, educators teaching a pharmacology course found that a switch from lecture based learning (LBL) to PBL teaching does not occur at the expense of factual knowledge transmission.⁵⁰ Students enrolled in the course also performed slightly better on standardized exams both in class and nationwide.⁵⁰

In a medical school in the United States, researchers hypothesized that standardized test performance between two groups (PBL and LBL) would be comparable.⁷³ Although students enrolled in the LBL scored slightly higher on the United States Medical Licensing Exams Step 1 and 2 (USMLE), those differences were not statistically significant.⁷³ The variation was also attributed to students performance on the Medical College Admission Test (MCAT).⁷³ Students with higher MCAT scores tended to do better on both exams regardless of which curriculum they were enrolled in.⁷³

To determine if differences existed between the clinical performance of physical therapy students in a PBL curricula, mixed model curricula (also known as hybrid) and traditional curricula, using the physical therapy clinical performance instrument (CPI), researchers collected midterm ratings and analyzed differences.⁷⁴ No statistically significant differences were found for any of the 24 items on the instrument.⁷⁴ Similar results were found when faculty introduced a PBL course to 2nd year dental students. Results showed that overall knowledge recall in the basic sciences by dental students did not differ between the two methods of instruction.⁵²

To identify whether students in PBL programs have a deficiency in basic science knowledge such as anatomy, researchers measured differences in PBL and TL of students enrolled in a medical school between perceived and actual levels of anatomy. The subjects completed a questionnaire (on perceived knowledge) and took a computerized anatomy test.⁷⁵ Results showed that PBL students had the same perceived level of anatomy knowledge as students at other medical schools. No significant effects on knowledge levels were found for PBL schools versus non PBL schools.⁷⁵

A frequent claim of proponents of PBL is that information is retained for longer. Research supports this claim and also has shown that as a result of PBL, students develop skills in self directed learning, which enables them to adapt to a changing practice environment.⁷⁶

Student/Faculty Perceptions and Satisfaction

PBL studies have examined student and faculty perceptions and satisfaction with this type of pedagogy. Although some students and faculty are reluctant to embrace the pedagogical transition, when PBL was compared to traditional modes of teaching, most studies have found a positive correlation between PBL and students and faculty's perceptions and satisfaction.^{12, 61, 67, 77-81}

In contrast to these positive effects of PBL, some studies have shown that students may not respond favorably to a new program. Nursing students reported an increase in anxiety levels, an increase in their need for support and a lack of understanding of the role of the facilitator.^{82, 83}

Graduates/Employers Perceptions

PBL programs have sought opinions of their graduates to enhance their overall program assessment. Results indicate that this pedagogic technique adequately prepares students for their professional careers.⁸⁴ Twelve nurses were interviewed to assess the impact that a PBL program had on their clinical nursing practice.⁸⁵ Although graduates reported similar “transitional” trauma to their counterparts enrolled in traditional programs, they also felt that the program made them more open minded, innovative and accountable for continually learning.⁸⁵ The most favorable result of this study was the

PBL graduates belief that their function as a professional was to become a catalyst for change within the nursing profession.⁸⁵

McMaster graduates perceived themselves to be better equipped in competencies, such as critical evaluation, problem solving and self directed study than their colleagues who had been traditionally trained in medical school.⁸⁶ Graduates of the Australian MacArthur medical school PBL program also believed that they entered practice as knowledgeable and skillful clinicians.⁸⁷ They developed self directed learning skills and felt particularly well equipped to cope with change, and were responsible for their own learning.⁸⁷ Finally, researchers wanted to determine if any differences existed in the perceptions of how well graduates felt prepared for employment as a preregistration house officer. Graduates from the PBL course rated the new course significantly more effective for a majority of the competencies and specific skills that were listed. Their supervisors also overwhelmingly rated PBL as better preparing graduates for employment.⁸⁴

Advantages/Disadvantages of PBL

Throughout the literature, individuals cite advantages and disadvantages with the implementation of PBL. Advantages that have been discussed are improved retention, development of an integrated knowledge base and an encouragement towards lifelong learning.^{75, 76, 85} As a result of cases, students are provided a greater exposure to clinical experience at an earlier stage in the curriculum.⁸⁶ Proponents of PBL report an increase in student-staff liaison as well as an overall increase in motivation⁸⁸ and also that students enhance their problem solving abilities, clinical reasoning skills and communication and

organizational skills.^{76, 89} Throughout the process, students learn to access and critique evidence based research.⁵⁴

Researchers also note there may be some disadvantages to adopting PBL. For example, an issue that may arise is student resistance.⁸² Many students have been educated in a traditional manner and are resistant to change. They may experience frustration and anxiety with the implementation of this new pedagogy.⁸² Many faculty are also resistant to change and may oppose this pedagogical model that moves them from the role of “sage on the stage” to facilitator.⁹⁰ They are reluctant to relinquish control of the learning process. Opponents of PBL have also cited coverage of content, faculty time and resources as issues that may arise.⁹⁰

Summary of Literature Review

PBL has been shown to be a viable alternative to traditional methods of teaching. Research has shown that content is not sacrificed and that students retain information longer than with traditional modes of teaching. Studies have also shown that performance on exams has been equal if not better, demonstrating that it can be an effective alternative to traditional pedagogy. Students’ attitudes toward learning are improved and their motivation to learn is enhanced with PBL. Faculty, although sometimes apprehensive about giving up “control” of the classroom, enjoy the PBL process. Problem solving, clinical reasoning and CT skills are enhanced. This is probably the greatest benefit to students, as they pursue their education.

Relevance of PBL to Athletic Training Education

Athletic training educators must seek ways to produce competent professionals who can navigate through information and who are able to critically think and solve problems. Many are seeking alternatives to the time consuming and often ineffective checklists that were developed in response to the 3rd edition of the NATA competencies. The 4th edition of the competencies and the newly modified BOC examination has been developed in response to ongoing education reform in the field of athletic training. The competencies and proficiencies combine analysis and synthesis of information with the application of clinical skills in patient care situations. The BOC examination is now administered in a computer based format and hybrid questions combine the practical and written simulation portions of the previous exam format. The hybrid questions also combine the analysis and synthesis of information with the application of skills. Education reform seeks to help programs produce individuals who can solve problems by using clinical reasoning and CT skills. PBL should be further investigated in athletic training education programs because of its effectiveness in helping students solve problems using previously learned knowledge through exploration of evidence based research and by taking responsibility for their own learning. Research should examine whether PBL plays a role in enhancing CT abilities and problem solving abilities. The current study was conducted to determine if the implementation of a PBL course in an athletic training curriculum had an impact on CT disposition and ability as measured by the CCTDI and CCTST respectively and how the students' disposition to critically think affected their CT score.

CHAPTER III

METHODS

A convenience sample of pre-athletic training, athletic training, and sports and exercise studies students was used to examine the effect of problem-based learning (PBL) on CT disposition and CT skills. In this chapter, the research design, description of the study participants, instrumentation, procedures, and data analysis techniques are presented.

Design and Setting

This experimental study used a 3x3 repeated measures design to compare CT skill scores and CT disposition scores in a control group and two experimental groups. The study took place at Greensboro College, a liberal arts institution, which is the employer of the primary investigator. Data collection took place in two sections of an undergraduate course titled ATH 1100 Prevention and Care of Emergencies and Athletic Injuries during the 2008 spring semester. The course was a requirement for all pre-athletic training majors seeking enrollment in a Commission on Accreditation of Athletic Training Education (CAATE) accredited athletic training education program (ATEP) as well as all exercise and sport studies (ESS) majors. The course included both introductory athletic training competencies as well as first aid and CPR competencies that require problem solving skills. A third group of athletic training and sports and exercise studies students served as a control group. This control group was not exposed to either teaching method.

Most of these students were upper level athletic training students enrolled in ATH 2310, ATH 3310 and ATH 4310, clinical education courses that are required of athletic training majors. Prior to collecting any data institutional review boards at Greensboro College and the University of North Carolina at Greensboro reviewed and approved the study (see Appendices A and B). Two modifications were necessary during the data collection period.

Subjects

Students at an undergraduate liberal arts institution were recruited to participate in the study. There were two sections (A and B) of ATH 1100 Prevention and Care of Emergencies and Athletic Injuries offered during the spring 2008 semester. The students were either pre-Athletic Training (PAT) majors or Exercise and Sport Studies (ESS) majors. Students enrolled in section A of ATH 1100 (n=10) were classified as the TL group and met Monday, Wednesday and Friday from 9:45-10:45 am. Students enrolled in section B (n=11) were the PBL group and met Monday, Wednesday and Friday from 12:15-1:15 pm. Students were allowed to choose which section they wanted to enroll in, although they did not know ahead of time that there were two different methodologies being employed. The classes were closed at 10 students per section and students needed to obtain written permission from the instructor to be added to the courses, ensuring that there would be an equal number of students per group. An additional group of students were recruited to serve as a control group. There were 11 students in the control group. Demographic data were collected on each student including gender, year in school, major, age, GPA and SAT scores.

Instrumentation

The teaching method was the independent variable and CT disposition and skill were the dependent variables. The dependent variables, CT disposition and CT skill scores were measured using the California Critical Thinking Disposition Inventory (CCTDI) (Insight Assessment, California Academic Press; Millbrae, CA) and the California Critical Thinking Skills Test (CCTST) (Insight Assessment, California Academic Press; Millbrae, CA) respectively. Both tests were developed by Facione and Facione, considered experts in critical thinking. The inventories were administered in an online format.

Three online surveys (Appendix J) were developed to assess students' attitudes towards either traditional methods of teaching or PBL. The surveys were developed by the researcher and included a Likert scale which ranged from most agreement to least agreement (Strongly agree=1, agree=2, disagree=3 and strongly disagree=4). The Traditional Learning Self-Assessment Form, administered to the TL group, consisted of 12 questions and examined students' perceptions of traditional learning on their problem solving and CT skills. The PBL Self-Assessment Form, administered to the PBL group consisted of 36 questions and was divided into the following sections: preferences, benefits of PBL, motivation and effects of PBL on problem solving and CT skills. The last section mirrored the traditional learning self assessment form. The PBL Team Assessment Form consisted of 23 questions and evaluated PBL students' preferences for working with groups, perceptions of group cohesiveness and their assessment of their personal contributions to their PBL group.

PBL Cases

Four progressive disclosure PBL cases were developed using a process recommended by experts in PBL.⁵ First, the objectives for the course were examined to determine which objectives would be compatible with a PBL module. Second, the modules were developed with real world concepts with ill-structured problems to challenge students to go beyond simply “solving” the problem.⁵ In the progressive disclosure format, students were required to identify learning issues that will allow them to discover more information. Students then do research, access new information and arrive at judgments and decisions based on sound clinical judgment and research. For each module, a template detailing the instructional plans was developed (see Appendix C)⁵ In addition, students were provided a detailed description of the PBL process and the explanation for each assignment (see Appendix D). The template and instructional plans were modified from templates designed by Robert Tallitsch, PhD with permission (see Appendix E) A list of resources was provided with each question to students to get them started in the process of research to guide them to appropriate references.

The PBL cases were first aid and emergency care issues and were developed in line with course objectives. Each of the cases were reviewed by two certified athletic trainers who have several years of experience using PBL and modified as necessary (see Appendix F). The scenarios focused on objectives for the course and included a cardiovascular condition, an anaphylactic reaction, a head injury and an endocrine condition.

Procedures

Data collection was completed in the spring semester, 2008. Subjects in the PBL group were randomly assigned to their PBL group and these groups remained consistent throughout the semester. Both experimental groups and the control group were pretested in the second week of classes using the CCTDI and CCTST (Wednesday of the 2nd week). During the sixteen week semester, the TL course was taught using traditional methods of lecture, class activities and laboratory sessions for the entire semester (16 weeks). The PBL course was taught the same as the TL course, using lectures and class activities, for the first half of the semester (7 weeks) and four PBL cases were implemented in the second half of the semester (9 weeks to 16 weeks). The students in the PBL group were randomly divided into three small groups, with a maximum number of 4 students allowed per group. Both sections of the course were taught by the primary investigator, ensuring consistency and that the courses were taught as intended. The control group was not exposed to either teaching method and took the CCTDI and CCTST at the beginning of the semester, the mid point of the semester and at the conclusion of the semester (see Table 1).

During the first week of classes, the Clinical Coordinator, who was not involved in data collection, met with the students from both the TL course and the PBL course to review the consent forms (see Appendix G). He also met with the students that served as the control group. All of the students read and signed the informed consent forms and the Clinical Coordinator collected the forms and gave them to the dissertation advisor. Participation was a mandatory class assignment but students had the option not to have

their data included for the analysis. At the conclusion of the semester, after final grades had been submitted, the investigator obtained the informed consent forms from the dissertation advisor to determine which individuals agreed to have their scores included in the study.

Table 1. Data Collection Schedule for Three Groups

	TL group	PBL group	Control group
Week 1	Informed Consent	Informed Consent	Informed Consent
Week 2	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST
Weeks 1-7 Instructional method	TL	TL	Neither
Week 7	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST
Week 8	SPRING BREAK	SPRING BREAK	SPRING BREAK
Weeks 9-16 Instructional Method	TL	PBL	Neither
Week 16	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST

Following the informed consent session, the instructor/primary investigator reviewed the syllabus for the course in which the students were enrolled (either TL or PBL) and explained the particular course design to the students (see Appendices H and I). Both the TL and PBL courses spanned the length of the semester.

During the semester, there were two modifications to the IRB. The first included adding the control group to the informed consent form and the second was to add the collection of subjective data at the end of the semester. (see Appendix B).

All subjects, including the control group were pretested on Wednesday and Friday, respectively of the second week of classes using the computerized version of the CCTDI and the CCTST. The scores served as the baseline score for subjects enrolled in both the TL and PBL sessions as well as the control group. The CCTDI and CCTST were again administered at the middle (7th week) and at the end of the semester (16th week). The first PBL case, the cardiovascular condition, was administered in the 9th and 10th weeks after midterm administration of the CCTDI and CCTST. The next three cases which included an anaphylactic reaction, a head injury and an endocrine condition were administered in weeks 10-11, 13-14 and 15-16 respectively.

At the end of the semester student perceptions of PBL were collected via electronic surveys distributed to students via email (see Appendix J). This information was not used to assign grades but assisted the instructor in understanding group dynamics, group cohesiveness and group participation.

Data Analysis

Critical thinking disposition and skill scores were tabulated by CAPSCORE Inc. of Insight Assessment and descriptive statistics were downloaded for analysis. The instructor provided an identification number for each participant and CAPSCORE Inc. provided the percentile in which each person was categorized. The total score and subscale scores were also be provided by the company. The number of participants, mean, median, standard deviation and minimum and maximum scores were provided to the researcher. SPSS software (version 16.0) was used for all statistical analyses with an a priori alpha level of .05.

Research Question 1: What is the effect of PBL on CT disposition and skill?

A repeated measures ANOVA consisting of 3 groups (TL, PBL and control) x 3 occasions (pre, mid, post) examined differences in groups across time for CCTDI scores. Post hoc testing using main effects testing was used to evaluate differences across time, between groups or to examine the group x time interaction. A repeated measures ANOVA consisting of 3 groups (TL, PBL and control) x 3 times (pre, mid, post) was used to evaluate changes in CCTST scores across time between groups. Written exam scores were analyzed with independent sample T-tests to determine if there were statistically significant differences between groups (TL and PBL) at exam 1, exam 2 or exam 3. Exam 3 was the only exam administered after implementation of PBL. The final lab practical scores were analyzed with independent samples T-tests to see if there were statistically significant differences between groups (TL and PBL) on the lab practical. The lab practical was administered at the end of the semester.

Research Question 2: Did CT disposition predict CT skills?

Separate regression analyses were used to determine the extent to which CCTDI predicted CCTST at pre and post test time points. Although not a part of the original research questions, further correlation analyses were performed on the entire sample to examine whether factors such as age, class, GPA or SAT affected CT disposition or skill.

Research Question 3: What are students' perceptions of the effect of PBL on CT and problem solving skills?

Subjective data from online surveys was analyzed and descriptive and group statistics were provided. Independent samples T-tests were performed to evaluate differences between the TL and PBL groups.

CHAPTER IV

RESULTS

Results include an overview of statistical analyses, descriptive statistics and the statistical analyses of each hypothesis.

Overview of Statistical Analysis

Two educational methodologies were implemented to assess the effect of PBL on CT disposition and skill. The data were analyzed using SPSS 16.0 software. The descriptive statistics including demographic data, and analyses are presented in the following section for each dependent variable. Then, differences in CT disposition and skill were examined for differences at the beginning of the semester, midpoint of the semester and at the conclusion of the semester. Although not part of the original research questions, to determine if PBL had an effect on content acquisition and clinical skill, written exam scores and lab practical scores were evaluated. Critical thinking disposition and skill were also examined to determine if disposition predicts skill. Finally, subjective data regarding student perceptions of PBL were collected via electronic surveys and analyzed from the TL and PBL groups.

Descriptive Data

Thirty-two college students participated in this study. Demographic and descriptive data for gender, degree major, year in school, age, GPA and SAT scores are included in Table 2.

Table 2. Group Demographics/Descriptive Data

Group	Gender		Major		Class		Age (SD)	GPA (SD)	SAT (SD)
TL group N=10	M	4	PAT	5	Freshmen	6	19 (.92)	3.00 (.56)	1092 (174)
	F	6	ESS	5	Sophomore	3			
					Junior	1			
					Senior	0			
PBL group N=11	M	4	PAT	6	Freshmen	6	19 (2.58)	2.63 (.73)	983 (166)
	F	7	ESS	5	Sophomore	4			
					Junior	0			
					Senior	1			
Control group N=11	M	4	AT	6	Freshmen	0	21 (.70)	2.99 (.56)	974 (168)
	F	7	ESS	4	Sophomore	2			
			Other	1	Junior	5			
					Senior	4			
Mean							20 (1.80)	2.87 (.63)	1011.07 (170.95)

Abbreviations: M, male. F, female. PAT, pre athletic training majors. AT, athletic training majors. ESS, exercise and sport studies majors.

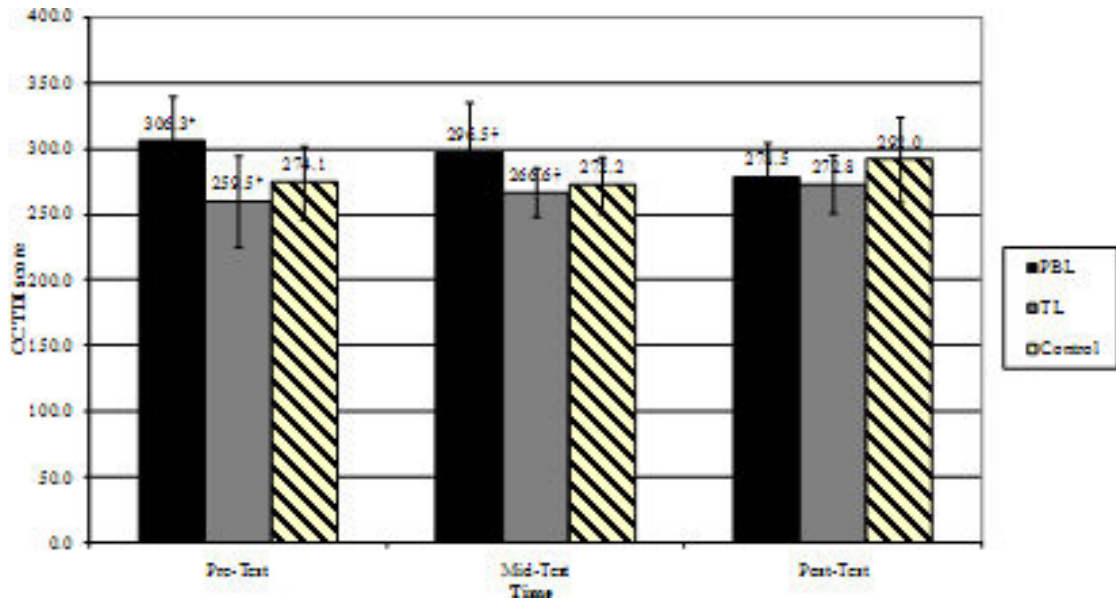
Observational analysis of demographic data indicates a difference in age and year in school, with the control group having a somewhat higher mean age and year in school than the TL and PBL groups.

Research Question One: CCTDI

The first research question examined the effect of PBL on CT disposition and skill. There were three hypotheses tested to determine the effect of PBL on CT disposition. Hypothesis one predicted there would be no difference in groups between pre to mid point testing scores on the CCTDI. Hypothesis two predicted that after implementation of PBL, scores from mid to post testing on the CCTDI would improve more than TL and control groups. Hypothesis three stated that CT disposition scores would increase over time regardless of teaching method. The repeated measures

ANOVA evaluating groups across time indicated a significant group effect ($F_{(2, 29)}=3.443$, $p=.046$) and group x time interaction ($F_{(4,58)}=4.620$, $p=.003$). There was no significant difference across time for any group ($p=.871$). Post hoc analyses using main effects testing revealed significant differences between groups at pretest ($p=.007$) and mid test ($p=.044$), but not at post test ($p=.270$) with PBL posting higher scores than TL but not the control group at pretest and mid test. This is because the PBL group scored higher on the pretest ($F_{(2, 29)} = 5.871$, $p=.007$) compared to the mid ($F_{(2, 29)} = 3.489$, $p=.044$) and post test ($F_{(2, 29)} = 1.369$, $p=.270$) while the TL and control group scores remained unchanged over time (see Figure 1).

Figure 1. CCTDI Scores at Pre-Test, Mid-Test, And Post-Test for PBL, TL, and Control Groups



* PBL>TL, $p=.007$; † PBL>TL, $p=.044$

Research Question One: CCTST

The first research question also examined the effect of PBL on CCTST. There were three hypotheses tested to determine the effect of PBL on CCTST. Hypothesis four predicted there would be no difference in groups between pre to mid point testing scores on the CCTST. Hypothesis five predicted that after implementation of PBL, scores from mid to post testing on the CCTST would improve more than TL and control groups. Hypothesis six stated that CT skills scores would increase over time regardless of teaching method. CCTST scores by group across time are reported in Table 3. A repeated measures ANOVA evaluating changes in CCTST scores across time and groups indicated no significant difference between groups ($F_{(2,29)}=.380$, $p=.687$), time ($F_{(2,29)}=1.674$, $p=.196$) or group x time ($F_{(4,58)}=1.061$, $p=.384$). All groups increased over time except the control group.

Table 3. Comparing the Difference within and between Groups in the Overall CCTST Score

Group	Pretest (SD)	Midterm (SD)	Posttest (SD)
TL group	13.00 (4.83)	13.8 (2.86)	14.10 (3.96)
PBL group	14.55 (4.66)	14.82 (4.58)	16.09 (5.07)
Control group	15.55 (4.70)	13.55 (5.41)	15.27 (4.71)
Mean Score	14.41 (4.69)	14.06 (4.35)	15.19 (4.55)

Performance on Exams

Content knowledge was evaluated by investigating written and practical exam scores for each group (TL and PBL). Written exams 1 and 2 were administered before PBL was implemented. Independent t-tests showed no significant differences between the two groups on each exam (Exam 1 $F_{(19)}=3.205$, $p=.261$; Exam 2 $F_{(19)}=1.838$, $p=.796$). Exam 3 was the final test and was administered at the end of the semester. Independent samples T-test showed a significant difference on the third exam ($F_{(19)}=.312$, $p=.007$). The TL group's mean score on the exam was 82.9(SD 7.18) and the PBL group's mean score on the exam was 72.77(SD 8.10).

Practical exam scores were also evaluated by examining grades for each group (TL and PBL). The lab practical was administered at the end of the semester. Independent samples T-test showed no statistically significant difference on the lab practical between the two groups ($F_{(19)}=.884$, $p=.392$). The TL group's mean score was 183.4(SD 10.75) and the PBL group's mean score was 177.9(SD 16.92).

Research Question Two

The second research question examined the relationship between CCTDI and CCTST. Separate regression analyses were used to examine the extent to which CCTDI predicted CCTST at pre and post test time points. Results indicate that CT disposition was not a significant predictor of CT skills at pre-test ($R^2=.001$, $p=.855$) or posttest ($R^2=.014$, $p=.518$). Further correlation analyses were performed on the entire sample to examine whether factors such as age, class, GPA or SAT affected CT disposition or skill,

and no relationships were found (see Table 4). However, once an outlier was removed, a correlation was found between GPA and CCTDI ($r=.131$).

Table 4. *The Effect of Age, Year, GPA, and SAT on Critical Thinking Disposition and Skill*

		Correlations					
		Age	Year	GPA	SAT	CCTDI1	CCTST1
Age	Pearson Correlation	1.000	.784**	.017	-.266	.237	.008
	Sig. (2-tailed)		.000	.926	.172	.192	.967
	N	32.000	32	32	28	32	32
Year	Pearson Correlation	.784**	1.000	.241	-.269	.088	.090
	Sig. (2-tailed)	.000		.185	.167	.631	.625
	N	32	32.000	32	28	32	32
GPA	Pearson Correlation	.017	.241	1.000	.290	-.047	.168
	Sig. (2-tailed)	.926	.185		.135	.798	.358
	N	32	32	32.000	28	32	32
SAT	Pearson Correlation	-.266	-.269	.290	1.000	.149	-.147
	Sig. (2-tailed)	.172	.167	.135		.449	.455
	N	28	28	28	28.000	28	28
CCTDI1	Pearson Correlation	.237	.088	-.047	.149	1.000	.081
	Sig. (2-tailed)	.192	.631	.798	.449		.469
	N	32	32	32	28	83.000	83
CCTST1	Pearson Correlation	.008	.090	.168	-.147	.081	1.000
	Sig. (2-tailed)	.967	.625	.358	.455	.469	
	N	32	32	32	28	83	96.000

** . Correlation is significant at the 0.01 level (2-tailed).

Research Question Three

The third research question examined students' perceptions regarding the effect of PBL on CT and problem solving skills. Hypothesis 1 predicted that students in the PBL group would perceive a greater improvement in CT and problem solving skills than students in the TL group. Table 5 describes students' perceptions of the teaching method (PBL or TL) on problem solving and CT skills. Independent samples T-tests showed significant differences between the two groups on perceived problem solving ability. Students in the PBL group perceived their problem solving skills to be enhanced more than students in the TL group ($F_{(16)}=1.103$, $p=.004$). Students in the PBL group also reported their problem solving skills improved over the semester more than students in the TL group ($F_{(16)}=2.842$, $p=.000$).

Table 5. Mean Scores of Students Enrolled in TL and PBL Course on the Effects of Teaching Method on Problem Solving and Critical Thinking Skills

(strongly agree=1, agree=2, disagree=3, strongly disagree=4)

Statement	TL (SD)	PBL (SD)	Combined Mean(SD)	P value
"I learned how to critically evaluate information and not be too quick to jump to conclusions."	1.80 (.42)	1.27(1.01)	1.52 (.82)	.142
"I feel that PBL/TL taught me to approach questions in a logical manner."	1.70 (.48)	1.50 (.53)	1.61(.50)	.417
"I feel that PBL/TL taught me how to make logical decisions."	1.70 (.68)	1.50 (.53)	1.61 (.61)	.504
"I believe my problem solving skills were enhanced because of PBL (TL)."	2.00 (.47)	1.25*(.46)	1.67 (1.67)	.000

Table 5—Continued

Statement	TL (SD)	PBL (SD)	Combined Mean(SD)	P value
“My ability to reach logical conclusions improved as a result of this course.”	1.80 (.42)	1.50 (.53)	1.67 (.49)	.201
“I feel that my problem solving skills improved over the semester as a result of PBL/TL.”	2.10 (.32)	1.25*(.46)	1.72 (.58)	.000
“I learned how to defend my position (answers) as a result of PBL/TL.”	2.00 (.00)	1.38* (.52)	1.72 (.46)	.001
“I feel that my ability to think critically improved throughout this course.”	1.90 (.32)	1.50 (.54)	1.72 (.46)	.065
“I feel that I was able to use knowledge gained in other courses to help me reach logical conclusions.”	1.90 (.57)	1.75 (.89)	1.83 (.71)	.201
“Overall, I would enroll in another PBL/TL course if given the opportunity.”	1.90 (.74)	2.13 (.99)	2.00 (.84)	.588
^“ I do not feel that I learned how to solve problems better as a result of this process.”	2.90 (.74)	3.00 (.76)	2.94 (.73)	.781
TOTAL MEAN	1.97	1.64	1.82	

^Negatively worded questions were reverse scored
 1=strongly disagree 2=disagree 3=agree 4=strongly agree

*p<.01 statistically significant

Table 6 describes feedback from students enrolled in the PBL course. The PBL self assessment survey was divided into four sections, one of which was described in Table 5 above (effects on problem solving/critical thinking skills) because both groups were asked to evaluate their problem solving and CT skills (TL and PBL). The other three sections, only included in the PBL self assessment survey, included preferences,

benefits of PBL and motivation. Statistical comparisons were not possible for these data.

The data are presented from strongly agree (1) to strongly disagree (4).

Table 6. *Problem-based Learning Self Assessment Survey: Mean Scores*
(strongly agree=1, agree=2, disagree=3, strongly disagree=4)

Subscale	Statement	Mean (SD)
Preferences	"I feel that lecture from the instructor is a more effective way to learn complex ideas than PBL."	1.25 (.71)
	"I prefer learning in the traditional mode (lecture) as opposed to PBL"	1.25 (.89)
	"I enjoyed taking responsibility for my own learning."	1.50 (.76)
	"I enjoyed working on these problems more than listening to lecture."	1.63 (.92)
	"I feel that PBL is a more effective method for learning than lecture."	1.63 (.92)
	"I feel more anxious about having to seek out information for the problems than I did listening to a lecture."	1.88 (.83)
	"Although this was a new process for me, I liked this alternative method of learning more than lecture."	2.00 (.76)
	"I prefer lecture to PBL."	2.50 (.93)
	"I feel that I would have learned more in a lecture setting than I did with PBL."	2.63 (.74)
Benefits of PBL	"I learned how to search for information (research articles, reference books, textbooks, etc.) outside of class."	1.25 (.46)
	"I learned how to decipher which websites are legitimate."	1.25 (.46)
	"I learned where to search for accurate information."	1.38 (.52)
	"My communication skills (written) improved as a result of the PBL process."	1.38 (.52)
	"My understanding of plagiarism improved as a result of these problems."	1.50 (.76)
	"My communication skills (oral) improved as a result of the PBL process."	1.75 (1.04)

Table 6—Continued

Subscale	Statement	Mean (SD)
	“I will retain more information related to these medical conditions than I would have if I had listened to it in a lecture format.”	1.75 (.89)
	“I have developed skills that will be invaluable to me in my academic career.”	2.13 (.84)
	“I have developed skills that will invaluable to me in my future career.”	2.25 (.89)
Motivation	“The problems motivated me to learn.”	1.38 (.52)
	“The problems motivated me to seek out additional information to find the answers that I was searching for.”	1.38 (.52)
	“My attitude towards learning improved as a result of these problems.”	1.38 (.52)
	“My drive to succeed was enhanced because of the motivation I had to find the answer to these problems.”	1.63 (.52)
	“The problems motivated me to study.”	2.00 (.93)

Table 7 describes the results of students’ subjective reports of preferences working with groups, groups’ cohesiveness, and perceptions of individual contribution to the group. No statistical analyses were conducted for comparison. The data are presented from strongly agree to strongly disagree.

Table 7. Problem-based Learning Team Assessment Survey: Mean Scores

Subscale	Statement	Mean (SD)
Preferences for working with groups	“Group discussions helped me to make connections among ideas more than I would have been able to do on my own.”	1.88 (.64)
	“My group worked as an effective team.”	2.00 (1.07)
	“I enjoyed working with other students in my group as opposed to working on my own.”	2.25 (1.04)
	“Our group worked in an efficient manner, more so than if I had worked on my own.”	2.38 (1.30)
	“I preferred working independently on these assignments as opposed to working with my group.”	2.38 (1.06)
	“I preferred working as a group on these assignments as opposed to working on my own.”	2.50 (1.20)
Group cohesiveness	“All members of my team contributed valuable information.”	1.63 (.74)
	“I felt other members of my group provided valuable contributions to our assignments.”	1.88 (.83)
	“Members of my team completed assigned tasks on time.”	2.00 (1.07)
	“All members of my team were actively involved in seeking information to answer the problems.”	2.00 (.93)
	“All members of my team participated in meetings outside of class.”	2.13 (.99)
	“Each member of my group cooperated by contributing a fair amount of effort towards achieving our group’s goals.”	2.13 (1.13)
	“I felt I could depend on other members of my group to complete tasks on time.”	2.13 (1.13)
	“Most members of my team contributed valuable information.”	2.25 (1.28)
	“I felt that information presented by other students was unreliable.”	3.13 (.83)
Perceptions of personal contributions to group	“I was able to make positive contributions to my group.”	1.50 (.76)

Table 7—Continued

Subscale	Statement	Mean (SD)
	“I was able to influence my group’s decisions.”	1.88 (.83)
	“I felt my group received my ideas and information with interest.”	1.88 (.83)
	“I found it difficult to express my opinions in my group.”	2.50 (1.20)
	“It was difficult for me to generate discussions in my group.”	2.63 (1.06)

CHAPTER V

DISCUSSION

The final chapter of this dissertation discusses the statement of the problem, reviews the methodology, summarizes the results, relates the results to previous research and discusses their implications for future study.

Critical Thinking Disposition

The first part of the first research question examined the effect of PBL on CT disposition. Critical thinking disposition in athletic training education has been explored to understand the trend in athletic training students and to promote pedagogical techniques for enhancing CT, however this was one of the first studies to measure changes that occurred in CT disposition as a result of a pedagogical practice.³ Disposition has been shown to be relatively stable over a period of years, however there is room for significant growth.²³ Therefore, we wanted to explore whether growth would occur as a result of PBL. In this study, results showed that PBL did not have an effect on CT disposition scores as measured by the CCTDI. There were no differences across time, however there were differences between groups. Scores were significantly higher in the PBL group at pre test and mid test. Therefore, past experiences may have nurtured the students' disposition toward CT or students' disposition toward CT may have been fostered in an educational environment that encouraged problem solving and CT. Another

explanation may be that it just so happened that students were more inclined to CT and ended up in that class by chance.

On the CCTDI, scores <280 are said to denote a weakness in critical thinking disposition and scores >350 are said to denote a strength in critical thinking disposition. In this study, students in the PBL group demonstrated a stronger critical thinking disposition (pre test=306.3, mid test=296.5, post test=278.5) than students in the TL group (pre test = 259.5, mid test=266.6, post test=272.8). Students in the control group demonstrated an overall weakness as well, (pre test=274.1, mid test=266.6, and post test=272.8). Overall, students demonstrated an overall weakness in disposition and therefore, if educators need to enhance critical thinking skill, they must first nurture the disposition.

In this study, PBL did not have an effect on CT disposition, however previous research in nursing has shown that PBL has been an effective method for enhancing CT disposition. The design of those studies varied from the current study, which may help to explain the reason for the difference. In one study, the PBL group showed a greater improvement in CCTDI scores from the 1st and 2nd time points. However, that study was a four year study, and the length of time from the 1st to the 2nd time point was one academic year with PBL being implemented the entire year.⁶⁸ In Turkey, a comparison was made between a PBL group and a traditional learning group in a nursing program and results showed a significant difference between groups in CT disposition scores. However, students in that study were only tested once, and with no pretest, it is difficult to claim that the teaching method was the sole reason for the differences in scores.⁹¹

Critical Thinking Skill

The second part of the first research question examined the effect of PBL on CT skill. In this study, PBL did not show a significant effect on CT skill as measured by the CCTST. Overall scores were below the mean in all groups (normative value established by Insight Assessment is 16.8), with the mean scores in each group demonstrating weak critical thinking skills (TL group =13.63, PBL group=15.15, Control=14.79).

In a previous study in athletic training, PBL was implemented to teach pharmacology competencies. The researcher reported students' clinical problem solving ability improved however, general CT skills as measured by the CCTST remained the same.⁹² A study in nursing was conducted to determine if students enrolled in a semester long college course in CT would show gains in CT as measured by the CCTST. Results showed significantly higher scores of students enrolled in the CT course than those in the control group.⁴⁰ Other studies in nursing have examined differences in CCTDI and CCTST scores, but those studies were cross sectional studies, typically between different levels of students with no intervention.^{11, 45, 93-95}

Experts in PBL have discussed the fact that significant differences in scores may not be evident with this non-traditional teaching method because the degree of change that would be required to see a large effect would be excessive.⁹⁶ Students are groomed for traditional settings where they are passive recipients of information so expecting them to do better in an active learning environment initially is an unrealistic expectation.⁹⁶ Students are used to being passive recipients of information, being told what to know. Many of them are not used to alternative methods of pedagogy. However, some

researchers believe that any improvement in critical thinking scores, whether statistically significant or not, will improve student motivation and enhance the learning environment..⁹⁶

Content Knowledge

Content knowledge was evaluated by reviewing exam scores for each group and a significant difference was found in students' performance on the final exam (the only exam administered after implementation of PBL). Results showed that students in the TL group performed better on the exam than students in the PBL group. Content knowledge may have been sacrificed as demonstrated in the scores for the third exam. This may have been due to the fact that TL students were exposed to all content and information was directly provided to them by the instructor (via lecture notes, Power Point presentations). PBL students were required to read the textbook, however if the information did not relate to the particular problem they were working on, they may not have read the information as thoroughly as they should have. The PBL students also needed to seek out information on their own, and had they not taken a particular path, may not have researched all of the information about a certain category of diseases (i.e. Marfan's syndrome). Instead, they might have explored one particular condition (i.e. myocardial infarction) in greater depth. Therefore, depth of content may have sacrificed the breadth of content covered. There is a concern that all of the necessary and required material may not be covered with PBL problems, however the depth of knowledge that students are exposed to is an important part of their ability to synthesize information.⁹⁷ Lab practical scores were also compared between groups and no statistically significant

difference was found between the two groups. This helps support the value of PBL in enhancing clinical skills because students in the PBL group were able to perform skills equally as well as students that had been taught the information in the lecture format and then instructed in a laboratory setting. These students “learned” the information through the problem and then were instructed on the skills in the laboratory setting. For example, the instructor observed that the students in the PBL group who had worked on the myocardial infarction case demonstrated more confidence in their decision making during the lab practical when told an individual had collapsed and required further assessment.

Several studies have found that although certain aspects of PBL are beneficial to developmental learners, PBL may be more appropriate in upper level courses, where students have a considerable amount of knowledge that can be invaluable in researching the answers to PBL modules.^{4, 49, 56, 66} Therefore, PBL may be more advantageous in upper level or capstone courses where synthesis of information is important and students are not being exposed to vast amounts of information for the first time.

Relationship between Disposition and Skill

The second research question examined the relationship between the CCTDI and the CCTST. Some dispositions tell us how a person will act. For example, if a person is compassionate, they most likely will display compassion to other individuals. We can predict how that person will behave or act in certain circumstances.³⁷ Therefore, we chose to explore if that was the case with CT. Other studies have examined this relationship as a correlation and have found positive correlations between the two scores; however, even though these correlations were statistically significant, they were

relatively weak.^{11, 45, 93} For example, one study in nursing showed a correlation of .318, which is a positive, statistically significant correlation. However, in this sample, only 9% of the variance in skills can be explained by the variance in overall CT dispositions, which in the overall scheme of things is not a significant amount.⁹³

In the current study, CT disposition did not predict CT skill. In fact, examining this further, research has shown that the two constructs are virtually independent of each other; however the two correlate separately with other measurements, such as GPA and SAT scores so those scores may help to predict success in those areas.³⁷ Although this study did not initially find any correlations between GPA, SAT and performance on these exams, when an outlier was removed, a correlation was found between the CCTDI and GPA ($r=.131$). Research has shown that the overall CCTDI score is significantly correlated with GPA.⁹⁸ An explanation for no significant findings in this study may be the small sample size or the students' lack of motivation to perform well on this exam because their performance on the two inventories (CCTST and CCTDI) was not tied to their grade in the course. This is discussed further in the following sections. Another explanation may be that his method of learning is not tested by traditional methods of testing.

A longitudinal study in nursing found that age and CT skill were not correlated, found no difference in gender and CT skill but did find a strong correlation of SAT scores with CT skill.⁴⁰ That study also found a significant relationship between a high score on the CCTST and success on the national nursing board exam (NCLEX). If strong positive correlations do exist, instruction in CT could be predicted to improve scores on tests such

as the SAT, MCAT or LSAT. This could be an area of research for AT educators to determine if a relationship exists between CT scores and performance on the BOC exam.

Student Perceptions of PBL

The third research question examined students' perceptions regarding the effect of PBL on CT and problem solving skills. Although statistically significant differences were not found in measurements on the CCTDI and CCTST, subjective data collected via online surveys showed significant differences in how students in the PBL group perceived their problem solving skills and ability to defend their positions as compared to the TL group. This is one feature of PBL that has been researched extensively because of the need for students to have strong CT skills and problem solving abilities. Studies have shown that PBL has enhanced CT skills and problem solving abilities in students as measured by content exams and self assessment surveys.^{12-14, 67, 68} Students in the PBL group enjoyed the opportunity to learn on their own, and reported that PBL not only motivated them to learn but also improved their attitude towards learning. Proponents of PBL have reported that this is perhaps the most important component to teaching and that successful teaching depends on improving motivation.^{99, 100} In addition, students reported that they learned how to search for accurate information, decipher legitimate websites, increased their understanding of plagiarism and improved their written communication skills as a result of the course. Searching for accurate information is a component of self directed learning, another favorable outcome of PBL.¹⁰¹ The instructor made several observations of PBL students' skills during the semester, primarily the improvement in their ability to accurately search for information. They learned the basis for evidence

based practice and its importance in the field of athletic training. Initially, they had relatively little understanding of how and where to search for accurate information. They were surprised to find inaccurate information in textbooks that they believed were accurate references.

Student Motivation and Attitudes toward Learning

Questions related to student motivation and conditions under which testing is accomplished have been raised. The researcher made the assumption that students would perform to the best of their ability on each of these exams, however, since performance on these exams was not tied to the course grade, students may not have tried as hard as they would have had the scores been tied to their grades. This was also a question that was raised in a longitudinal study of CT in nursing programs, but was not actually evaluated.⁴⁰ Another study showed that when students were told that the CCTST was their course final exam, they showed a mean improvement of nearly 5 points from their pre test scores.¹⁰² Therefore, somehow tying students' performance to the course grade may show greater improvements in scores. Other factors that may have contributed to scores were the times that the tests were administered. At the beginning of the semester, students may have been motivated to do well in their courses. At the mid test, students were getting ready for spring break and were focused on getting off campus. The final tests were administered during the last week of classes, when students were anxious to leave for summer vacation. These are all factors which are difficult to control for in a "real" environment.

Limitations

A limitation of this study was the number of participants. Enrollment in the course for the fall semester was limited to encourage enrollment in the spring courses. The purpose of this study was not to generalize the results to a general population but to determine if PBL has an effect on CT disposition and CT skills and to also determine if there was a relationship between the two scores. To control for selection bias, students were not aware that there were two different methodologies being employed in the two different sections when they registered for the course. Students may have experienced events during the semester which affected the results; however the researcher cannot control personal situations. The researcher also did not have the ability to control for students' prior academic issues such as documented learning disabilities. Finally, the length of time that PBL was implemented (8 weeks) in the current study may have been a factor in the results. However, since positive changes in critical thinking skill were observed in both groups, implementing PBL for a longer period of time may show statistically significant changes in scores. Unfortunately, the researchers did not find any information that recommends how long PBL should be implemented.

Delimitations

Only undergraduate pre-athletic training, athletic training and sports and exercise studies students at a liberal arts institution served as subjects in this study. Only students enrolled in ATH 1100B received the intervention (PBL). PBL was only assessed using progressive disclosure cases. Therefore, the ability to generalize the results of this study to other methods of PBL can be affected.

Recommendations for Implementation and Future Research

Additional studies in athletic training education are needed to further evaluate the relationship between PBL and CT disposition and skill. This study provided a foundation for future studies in this area. This data from the PBL group could be used in a follow up study when these students are seniors to determine if their disposition or skill changed throughout their college careers. That data can then be used to determine if there is a correlation of CT disposition or skill to performance on the BOC exam.

The researcher encourages further investigations of non traditional methods of teaching to help students learn, motivate them to learn and as a vehicle to evaluate student performance. Future research could examine the effect of PBL on CT disposition and skills in other athletic training education programs, with pre tests serving as a baseline score. It would also be interesting to compare CT disposition and skill scores between undergraduate and entry level graduate programs to investigate the effect of age and maturity level on those scores.

The researcher will continue the use of PBL in the classroom, however plans to combine lectures with PBL modules. This would provide students with the opportunity to gain content knowledge and then use that knowledge to help them truly understand the information, similar to learning in a clinical environment. Lectures can introduce important content, allow the faculty member to elaborate on difficult concepts or introduce evidence based research that are not available to students.¹⁰³ Then modules can allow students to make connections and can be used as an assessment of students' comprehension of the material. Problem-based learning could be used in an upper level

medical conditions course, where the anatomy and physiology of the body system being studied and the category of medical conditions are presented in a lecture format and then students are given a progressive disclosure case to further understand the medical condition and the clinical implications of the disease.

Application of Study

The implications of this study will be extremely valuable to athletic training educators as they search for pedagogical techniques to enhance CT in AT. Students perceived this type of teaching to enhance CT and problem solving skills through repeated practice and feedback as they work on problems, therefore educators should take advantage of this. For example, educators can develop problems so that students understand the anatomy and physiology behind the condition (i.e. Myocardial infarction; What is occurring physiologically in the heart when a heart attack occurs?). While working through PBL cases, students can develop a deeper understanding of the clinical concepts which are essential in the clinical problem solving process regarding patient care decisions, thus enhancing critical thinking ability. Next, students develop self directed learning skills which enhance their ability to critically evaluate sources. Students in this study learned how to search for information in the library, via textbooks, reference books, medical dictionaries and the internet. They learned how to decipher which websites are legitimate and what information they need to look for on websites to determine if the information provided is accurate, to assess professional credentials and to determine if information is current. They learned the importance of evidence based research. As discussed before, these skills are crucial to have when information is

constantly changing and employment for athletic trainers is expanding to non-traditional settings. Third, students used their critical thinking skills when developing hypotheses and supporting those hypotheses with evidence. After developing specific learning issues, they had to analyze their options and defend their position. Questions developed for each case required the students to critically think about each case and discuss the methods of treatment that they would provide and defend why they would choose that treatment. Therefore, they had to critically think about which treatment they would use and defend that choice.

Although some studies show faculty resistance⁹⁰ when implementing PBL, this study found just the opposite. The facilitator found it to be an enjoyable educational experience in that it forced a recall of basic anatomy and physiology as well as a thorough understanding of the information before assigning the problems. However, this may be an unfair comparison because there was only one instructor and she was motivated to implement PBL in her classroom. Some faculty cite time and resources as an issue with the implementation of PBL.⁹⁰ This researcher found that once the template was developed and cases were written, the time involved was limited to grading the assignments, which is required in traditional environments as well. Through observation, the facilitator noted that the PBL group demonstrated enthusiasm and were motivated to seek answers to the problems, making it an enjoyable learning environment. The researcher made several observations during the study and was surprised that many students did not know how to search for accurate information, nor did they understand the true definition of plagiarism. It was obvious throughout the semester that students

developed those skills. Those lifelong learning skills will benefit the students throughout their academic and professional careers, even if they may not understand that concept yet.

As part of this project, the researcher thoroughly examined PBL and developed tools to assist educators in designing, implementing and evaluating PBL modules. These tools could be used by other athletic training educators to develop cases for use in their own courses. The researcher also developed surveys to assess students' perceptions of the teaching method used for their particular course, which could also be used by educators in athletic training to assess students' opinions and attitudes about traditional methods of teaching versus PBL.

Conclusion

Changes in athletic training education have warranted necessary changes in how we help our students learn. With the changes in the 4th edition of the competencies and the BOC exam, as well as changes in society, students must be able to analyze and synthesize information and make quick decisions based on sound reasoning. These decisions can be life or death decisions. Traditional methods of teaching typically do not allow students to be actively involved in their own learning, to seek out resources and find solutions to problems. Educating students with good CT skill requires that educators combine the development of CT skills while nurturing those dispositions.¹⁰² PBL is a pedagogical technique that can help students develop problem solving skills by allowing them to explore real life scenarios without fear of harming the individual. Students learn how to evaluate the situation, seek additional information, find answers to questions and explore different hypotheses. Then, based on the information they have and using results

from diagnostic tools/tests they can make appropriate evaluation and treatment decisions. This “practice” is an essential tool in the educational process and a progressive step towards clinical proficiency. If students are exposed to these situations in the classroom and have time to essentially understand the underlying injury and/or medical condition, they will be more prepared in the clinical environment when these situations occur in an emergency situation. Students will gain confidence in their decision making abilities and will be able to transfer that confidence to the clinical setting. Even though statistically significant changes were not found in this study, PBL was found to be a viable alternative to traditional lecture. The faculty member found it an enjoyable environment, where students demonstrated enthusiasm in the classroom and were able to make connections among ideas. Students’ ability to solve problems were enhanced and they developed skills that are crucial for success as future athletic training professionals.²²

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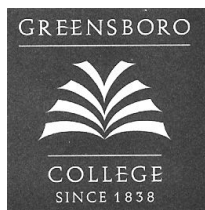
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Appendix A

RPDS Approval at Greensboro College



February 1, 2008

Michelle Lesperance
Assistant Professor of Athletic Training
Proctor Hall West
Greensboro College
815 W. Market Street
Greensboro, NC 27401

Dear Professor Lesperance:

Your request to pursue human subjects research for the project titled "The Effects of Problem-Based Learning on Students' Critical Thinking Skills" has been approved.

The Research and Professional Development Subcommittee unanimously approved this request, and in writing, in December 2007. Upon the recommendation of RPDS, the Greensboro College Faculty Affairs Committee also approved your request at the meeting of Thursday, January 31, 2008.

Your materials will be forwarded to the office of the Vice President for Academic Affairs, Dr. Paul Leslie. I have enclosed a copy of the approval documents for your own records.

Sincerely yours,

Kathleen Keating
Chair, Research and Professional Development Subcommittee

CC: Paul Leslie, VPAA
Neill Clegg, Chair, FAC

815 W. MARKET ST.
GREENSBORO, NC
27401-1875
(P) 336.272.7102
(F) 336.271.6634
www.gborocollege.edu

Request for Approval of Human Subjects Research

THE RESEARCH AND PROFESSIONAL DEVELOPMENT SUBCOMMITTEE REQUEST FOR APPROVAL OF HUMAN SUBJECTS RESEARCH

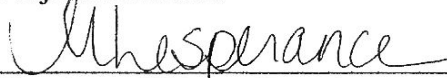
RESEARCHER: Michelle M. Lesperance, MS, ATC, LAT
Asst. Professor of Athletic Training

CAMPUS ADDRESS: Proctor Hall West 110, mlesperance@gborocollege.edu, X 629

TITLE OF PROPOSAL:

The Effects of Problem-Based Learning on Students' Critical Thinking Skills

I attest that the information contained in this proposal is complete and accurate. Further, the procedures are in accord with the Greensboro College "Code of Ethics for Human Subjects Research."


Signature of Primary Investigator

12/12/2007
Date

For Subcommittee Use

Proposal # 2008 #1

Subcommittee Action

Date

Approved in December by RPDS
1/31/08

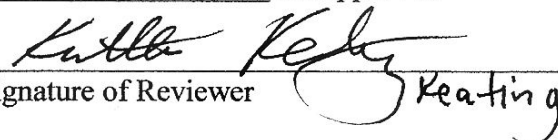
For the Reviewer:

Please review the proposal with respect to its adequacy in meeting ethical standards and return it to the Subcommittee Chair as soon as possible. Give your recommendation below. If you find the proposal other than acceptable, please provide explicit reasons on a separate sheet.

☒ Acceptable

☐ Undecided until further information is provided

☐ Not approved


Signature of Reviewer

1/31/08
Date

Request for Approval of Human Subjects Research

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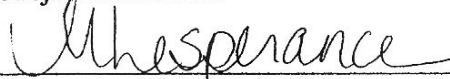
RESEARCHER: Michelle M. Lesperance, MS, ATC, LAT
Asst. Professor of Athletic Training

CAMPUS ADDRESS: Proctor Hall West 110, mlesperance@gborocollege.edu, X 629

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Not approved


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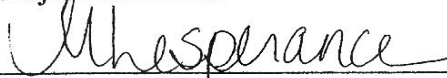
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Signature of Reviewer

31 JAN 08
Date

Request for Approval of Human Subjects Research

THE RESEARCH AND PROFESSIONAL DEVELOPMENT SUBCOMMITTEE REQUEST FOR APPROVAL OF HUMAN SUBJECTS RESEARCH

RESEARCHER: Michelle M. Lesperance, MS, ATC, LAT
Asst. Professor of Athletic Training

CAMPUS ADDRESS: Proctor Hall West 110, mlesperance@gborocollege.edu, X 629

TITLE OF PROPOSAL:

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Date

For Subcommittee Use

Proposal # _____

Subcommittee Action _____

Date _____

For the Reviewer:

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_____ Acceptable

_____ Undecided until further information is provided

_____ Not approved

Signature of Reviewer

Date

Request for Approval of Human Subjects Research

A written response to each question is required. Attach extra pages if necessary.

1. What is the purpose of the proposed study? If the study is a replication or an extension of a prior study, please provide the approval number and/or the name of the investigator and date of the original proposal.

The purpose of this study is to examine the effects of Problem Based Learning (PBL) on undergraduate students' critical thinking disposition scores as measured by the California Critical Thinking Disposition Inventory (CCTDI) and critical thinking skills as measured by the California Critical Thinking Skills Test (CCTST). The researcher will also examine whether there is a significant relationship between a student's disposition to critically think and their critical thinking scores.

2. Describe the participant population and the procedure for recruiting participants. For child research, attach a copy of the letter to be sent to parents and a copy of letters and/or forms to be sent to school administrators and teachers in the case of child student research.

The participant population included in this study are Greensboro College students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries, Sections A and B. Athletic training majors will serve as the control group.

3. What procedure(s) will be used to protect participants' anonymity?

Students will be provided with an ID # that is based on random number generation. The master list of names and ID#'s will be deidentified once the data is entered into the computer.

4. What procedure(s) will be used to protect the confidentiality of data collected?

All data will be stored in the Principal Investigator's office and will not be uploaded to GCnet accounts.

5. Outline, briefly, the research methodology you will employ. Attach to this proposal a detailed description of the proposed methodology.

This quasi-experimental study will use a 3x3 repeated measures design to compare critical thinking scores and critical thinking disposition scores in a control group and two experimental groups. This study will take place at Greensboro College, a liberal arts institution, which is the employer of the primary investigator.

Participants will be students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries, sections A and B. Section A will be taught using traditional methods (TL) for 16 weeks and section B will be taught using TL for 8 weeks

and PBL for 8 weeks. The control group will not be exposed to either teaching method. staff will serve as qualitative artifacts for this research. The CCTDI and CCTST will be administered in weeks 2, 7 and 16.

A complete description of the methodology is attached.

6. Describe any physical, psychological or emotional stress to which participants may be exposed. Offer an appraisal of the degree of participant risk.

There are no known physical, psychological, or emotional risks associated with this research study, however should a student experience any negative cognitive or emotional responses, students will be referred to Emy Gamb, school counselor for debriefing.

7. Explain how you plan to handle situations in which a participant might unexpectedly become upset or uncomfortable during your procedure.

In the event a member participant becomes uncomfortable or upset during the semester, they can meet with the principal investigator and choose to not have their scores included in the research study. If the issue cannot be resolved by the Principal Investigator, the student will be referred to the counselor at Greensboro College.

8. Are human subjects to be tested or observed without their knowledge or consent? If so, explain why. Indicate how and when these participants will be informed of their role in your research. If they will not be informed, explain why.

Human subjects will be explicitly aware of their participation in this research and will provide consent to participate. See attached consent form.

9. Will the participants be deceived or misinformed? If so, explain. What special debriefing provisions will be used?

No, this provision does not apply.

10. Is there any reason why the participants cannot be informed, after testing, of the purpose of the study and the rationale for the methods used? If there is, explain.

No, this provision does not apply.

11. Describe the procedures that will be used to inform participants of the purpose, rationale and findings of the study. When and how will this information be conveyed to participants? For child participants, how will parents, teachers, and/or schools be informed about the outcomes of the research?

Participants will be informed of the purpose and rationale for the study on the first day of classes. Participants will be informed that they can request information on the findings of this study at the conclusion of the study.

Description of the Proposed Methodology

A convenience sample of kinesiology students will be used to examine the effect of problem-based learning (PBL) on critical thinking disposition and critical thinking skills. In this chapter the research design, description of the study participants, instrumentation, procedures, and data analysis techniques are presented.

Design and Setting

This quasi-experimental study will use a 3x3 repeated measures design to compare critical thinking scores and critical thinking disposition scores in a control group and two experimental groups. This study will take place at Greensboro College, a liberal arts institution, which is the employer of the primary investigator. Data collection will take place in two sections of an undergraduate course titled ATH 1100 Prevention and Care of Emergencies and Athletic Injuries during the 2008 spring semester. The course is a requirement for all athletic training majors enrolled in a Commission on Accreditation of Athletic Training Education (CAATE) accredited athletic training education program (ATEP) as well as all exercise and sport studies (ESS) majors. The course includes both introductory athletic training competencies as well as first aid and CPR competencies. A third group of AT students will serve as a control group. This control group will not be exposed to either teaching method. None of those students have had exposure to PBL. Prior to collecting any data, the Research and Professional Development Subcommittee at Greensboro College and the Institutional Review Board at the University of North Carolina at Greensboro will review and approve the study.

Subjects

Students that are enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries at an undergraduate liberal arts institution will be recruited to participate in the study. There are two sections of the course, sections A and B. These students are either Athletic Training (AT) majors or Exercise and Sport Studies (ESS) majors. The estimated number of students in each class is 11 students, with a maximum of twelve students allowed per section. An additional group of students will be recruited to serve as a control group. There will be 11 students in the control group.

Instrumentation

Measuring Critical Thinking Disposition and Skills

In 1987, the American Philosophical Association (APA) determined there was a need for a clear consensus definition of CT.⁸⁴ Using the Delphi technique, a facilitator identified 46 CT experts (from Philosophy, Psychology, Education and other physical and social science disciplines) across the United States and Canada and these individuals communicated over two years until a consensus definition of CT was reached.⁸⁴ The resulting definition describes CT as a “purposeful, self-regulatory judgment”.⁴⁸ Two dimensions of CT evolved from this, the cognitive abilities dimension and the affective dimension. These dimensions allowed identification of skills and sub-skills that must be

developed in order to become a better critical thinker and they also identified characteristics of strong critical thinkers.⁸⁴

The California Critical Thinking Disposition Inventory (CCTDI) was developed to measure critical thinking disposition and the degree of such disposition.³⁷ An individual's CT disposition is their internal motivation to solve problems and make decisions based on sound reasoning.² There are seven constructs/scales that are characteristics of individuals who are able to think critically.³⁷ These constructs include inquisitiveness, open-mindedness, systematicity, analyticity, truth seeking, critical thinking self confidence and maturity.⁵⁰ The overall score is the critical thinking disposition score, a score that is computed with equal contributions of each scale.³⁹ There are a total of 75 items (9 to 12 questions for each scale) that use a likert type scale, with answers (1) disagree strongly, (2) disagree (3) disagree marginally (4) agree marginally (5) agree and (6) strongly agree. For each scale, an individual's score can range from 1-60, for a total possible score for all 7 scales to be 420. A total score of <280 is said to denote a weakness in critical thinking disposition and a total score >350 refers to a strength in critical thinking disposition.³⁷ For individual scales, a score less than 40 denotes a weakness in CT disposition in that area. The Cronbach's alpha coefficient for the CCTDI was reported to be .90 by the developers of the instrument.⁵⁰ The CCTDI is available in electronic or paper form. E-testing will be used for data collection purposes in this study.

The consensus definition of CT was the impetus for the development of the California Critical Thinking Skills Test (CCTST).⁸⁴ The CCTST is an instrument designed for assessing an individual's critical thinking skills. It has been used by colleges and universities to gather data on individual and group critical thinking skill levels.⁸⁵ The CCTST measures CT through five constructs: interpretation, analysis, evaluation, explanation and inference.⁸⁵ There are 34 multiple choice problems on the test and some questions have 4 choices (a-d) and some have 5 choices (a-e). Some questions are presented with images and diagrams, which is a new feature of the CCTST. The CCTST reports 6 scores, the overall score and then separate scores for each of the 5 constructs of CT.⁸⁴ Each correct answer is assigned 1 point, therefore scores can range from 0 to 34, with higher scores reflecting stronger critical thinking ability.³⁷ The researchers established norms on the test to range from 2-29, with a standard deviation of 4.46. The established mean is 15.89.³⁹ Therefore, scores that fall below the mean are said to translate into weak critical thinking skills and a score greater than the mean translates into stronger critical thinking ability.³⁷ Reliability of the CCTST was established using Kuder Richardson-20 alphas that range from .68 to .70.⁸⁵ An achievable level of internal reliability in such instruments is typically regarded to be .65-.75.⁸⁴ Therefore, the range of .68 to .70 supports its reliability to measure CT skills. Concurrent validity and content validity have also been demonstrated for this instrument.⁸⁶ Construct validity was derived from the American Philosophical Association 1990 Delphi Report. Strong correlations have been reported with college level GPA, SAT verbal and math scores and Nelson-Denny Reading scores which have been used as predictors of freshman level college GPA.⁸⁴

Form 2000 of the CCTST is a 34 item multiple choice format and students are given 45 minutes to complete it. It is the most updated version of this test and includes critical thinking questions that require the application of reasoning skills. The test is

available in written copy or via e-testing for a fee from The California Academic Press, LLC. E-testing will be used for data collection purposes in this study.

[The following section is reproduced from my dissertation materials; endnotes are available upon request.]

PBL Cases

Four progressive disclosure PBL cases were developed using a process recommended by experts in PBL.¹⁸ First, the objectives for the course were examined to determine which objectives would be compatible with a PBL module. Second, the modules were developed with real world concepts with ill-structured problems to challenge students to go beyond simply “solving” the problem.¹⁸ In the progressive disclosure format, students are able to identify learning issues that will allow them to discover more information. They then do research, access new information and arrive at judgments and decisions based on sound clinical judgment and research. For each module, a template detailing the instructional plans was developed.¹⁸ In addition, students are provided a detailed description of the PBL process and the explanation for each assignment. A list of resources is provided with each question to students to get them started in the process of research to guide them to appropriate references.

The PBL cases are first aid and emergency care issues and have been developed in line with course objectives. Each of the cases were reviewed by two certified athletic trainers who have several years of experience using PBL and modified as necessary. The scenarios focus on objectives for the course and will include a cardiovascular condition, hyperglycemia, a head injury and an anaphylactic reaction.

Procedures

Data collection will be completed in the spring semester, 2008. Students enrolled in section A of ATH 1100 will be classified as the TL group and will meet MWF 9:45-10:45 am. Students enrolled in section B will be the PBL group and will meet MWF 12:15-1:15 pm. There are 11 students enrolled in each course. Students were allowed to choose which section they want to enroll in, although they did not know ahead of time that there are two different methodologies being employed. Subjects in the PBL group will be randomly assigned to their PBL group and these groups will remain consistent throughout the semester.

Eleven AT students not enrolled in either of these sections will be recruited to participate as the control group. All students will be pretested in the second week of classes using the CCTDI and CCTST (Monday of the 2nd week). During the sixteen week semester, the TL course will be taught using traditional methods of lecture, class activities and laboratory sessions for the entire semester (16 weeks). The PBL course will be taught the same as the TL course, using lectures and class activities, for the first half of the semester (7 weeks) and four PBL cases will be implemented in the second half of the semester (9 weeks to 16 weeks). The students in the PBL group will be divided into two-three small groups depending on enrollment, with a maximum number of 4 students per group. The control group will not be exposed to either teaching method and will take the CCTDI and CCTST at the beginning of the semester, the mid point of the semester and at the conclusion of the semester (see Table 1).

TABLE 1:

	Section A: TL	Section B: PBL	Control Group
Week 1	Informed Consent	Informed Consent	Informed Consent
Week 2	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST
Week 7	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST
Weeks 1-7 Instructional method	TL	TL	Neither
Week 8	SPRING BREAK	SPRING BREAK	SPRING BREAK
Weeks 9-16 Instructional Method	TL	PBL	Neither
Week 16	CCTDI CCTST	CCTDI CCTST	CCTDI CCTST

On the first day of classes, the Clinical Coordinator will meet with the students from both the TL course and the PBL course to review the consent form. He will also meet with the students that will serve as the control group in a clinical education course. All of the students will read and be given the opportunity to sign the informed consent form and the Clinical Coordinator will collect the forms. Participation is mandatory because familiarizing students with various assessment instruments is already part of the course curriculum. Although the activity itself is therefore a course requirement, students may select whether they wish their private data to become part of the analysis. Therefore, students will be made aware that they have this choice not to have their data included in the analysis and that the instructor will not know who has given consent until after completion of the course. Following the informed consent session, the instructor will review the syllabus for the course in which the students are enrolled (either TL or PBL) and will explain the particular course design to the students. Both the TL and PBL courses will span the length of the full semester.

All subjects, including the control group will be pretested on Monday of the second week of classes using the computerized version of the CCTDI and the CCTST. This score will serve as a baseline score for subjects enrolled in both the TL and PBL sessions as well as the control group. The CCTDI and CCTST will again be administered at the middle (7th week) and at the end of the semester (16th week). The first PBL case, the cardiovascular condition, will be administered in the 9th and 10th weeks after midterm administration of the CCTDI and CCTST. The next three cases

which include an anaphylactic reaction, a head injury and hyperglycemia will be administered in weeks 10-11, 13-14 and 15-16 respectively.

Both courses will be taught by the primary investigator, ensuring that the courses will be taught as intended.

Data Analysis

The teaching method will be the independent variable and critical thinking disposition and skill will be the dependent variables. The dependent variables, critical thinking disposition and critical thinking skill scores will be measured using the CCTDI and the CCTST respectively. SPSS software (version 14.0) will be used for all statistical analysis with an a priori alpha level of .05. The dependent variables (CCTDI and CCTST) were examined for main effects and interactions with a repeated measures 3 groups (control, TL, PBL) x 3 times (pre, mid, post) analysis of variance. Post hoc testing for time will consist of repeated contrast within groups with a Bonferoni correction. Post hoc testing for group will consist of a univariate ANOVA. A regression analysis will be used to assess the relationship between critical thinking disposition and critical thinking skills.

Critical thinking disposition and skill scores will be tabulated by CAPSCORE Inc. of Insight Assessment and descriptive statistics will be sent to the researcher for analysis. The instructor will provide an ID# for each participant and CAPSCORE Inc. will provide the percentile that each person was categorized in. The total score and subscale scores will also be provided by the company. The number of participants, mean, median, trimmed mean, standard deviation of the standard error of the mean and minimum and maximum scores will be provided to the researcher.

Research Question 1: What is the effect of PBL on critical thinking disposition and skill?

Hypothesis 1: There will be no difference in groups between pre to mid point testing scores on the CCTDI.

Hypothesis 2: After implementation of PBL, scores from mid to post testing on the CCTDI will improve more than the TL and control groups.

Hypothesis 3: Critical thinking disposition scores will increase over time regardless of teaching method.

Hypothesis 4: There will be no difference in groups between pre to mid point testing scores on the CCTST.

Hypothesis 5: After implementation of PBL, scores from mid to post testing on the CCTST will improve more than the TL and control groups.

Hypothesis 6: Critical thinking skills scores will increase over time regardless of teaching method.

Research Question 2: Does CT disposition predict CT skills?

Hypothesis 1: There is a positive correlation between the CCTDI and CCTST.

Greensboro College

Consent to Participate in Human Subjects Research

Project Title: The Effects of Problem-Based Learning on Students' Critical Thinking Skills

Project Director: Michelle M. Lesperance

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PURPOSE AND PROCEDURES:

The purpose of this study is to examine the effects of PBL on undergraduate students' critical thinking (CT) disposition scores as measured by the California Critical Thinking Disposition Inventory (CCTDI) and critical thinking skills as measured by the California Critical Thinking Skills Test (CCTST). The researcher will also examine whether there is a significant relationship between a student's disposition to critically think and their critical thinking scores.

Participants will be enrolled in ATH 1100 A or B Prevention and Care of Emergencies and Athletic Injuries or will be a control group of AT students. Students will be required (as part of the course requirements) to take an online examination to assess critical thinking disposition and skills three times during the semester. This testing will take place during the regularly scheduled class time.

POTENTIAL RISKS AND DISCOMFORTS:

There is no risks to participation

POTENTIAL BENEFITS: There is no direct benefit to participants. These results will be used to give a better understanding of the positive benefits of alternative methods of teaching as well as the relationship between CT disposition and skill.

CONSENT: By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse consent or to withdraw your consent to have your data included in this research at any time without penalty or prejudice; your participation is entirely voluntary. The principal investigator will not have access to information regarding who agreed to participate in the study until final grades are submitted. Your privacy will be protected because you will not be identified by name as a participant in this project. All data will be secured in the Project Director's office for a period of three years and will then be destroyed.

The Greensboro College Research and Professional Development Subcommittee has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Dr. Kathleen Keating at (336) 272-

7102 x308. Questions regarding the research itself will be answered by Michelle Lesperance by calling 336-272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are affirming that you are 18 years of age or older and are agreeing to participate in the project described to you by Dr. Robert Charles-Liscombe.

Participant's Signature*

Date

Appendix B
IRB Approval at the University of
North Carolina at Greensboro



THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

Office of Research Compliance

2718 Beverly Cooper Moore and Irene Mitchell Moore
Humanities and Research Administration Building
PO Box 26170, Greensboro, NC 27402-6170
336.256.1482 Phone 336.256.1482 Fax
www.uncg.edu/orc/

January 8, 2008

Dr. Jolene Henning
Exercise and Sports Science
237L HHP Building
Refer to: IRB No.078178

Dear Dr. Henning,

As required by University policy a member of the UNCG IRB has given your research protocol entitled "The Effect of Problem-Based Learning on Students' Critical Thinking Skills" (IRB No. 078178) an exempt review as permitted under UNCG's Federal Wide Assurance (FWA 00000216). Your minimal risk protocol has been deemed exempt under section B1 of 45 CFR 46.101.

You should be aware that any changes in your protocol must be approved by the IRB prior to being implemented. Likewise, any problems, complaints or injuries that arise during the course of your project which involves human participants must be reported promptly to the Office of Research Compliance. The approved informed consent form is attached. This version must be used when obtaining informed consent as outlined in this protocol but the stamp does not need to appear on the form.

This research protocol is valid for five years unless changes are made which remove the exempt status. You will receive a continuing review form prior to the fifth anniversary to keep this protocol active. Conversely you are responsible for notifying the ORC when your study is completed and all work is published. Thank you for your cooperation on this matter and best wishes on your project.

Sincerely,

Eric Allen, Director
Office of Research Compliance
Cc:



**University of North Carolina at Greensboro
Institutional Review Board for the Use of Human Participants in Research
REQUEST FOR EXEMPT REVIEW**

078178

Title of Project: *The effects of problem-based learning on students' critical thinking skills.*

Principal Investigator: *Jolene Henning* Department: *ESS*
*Students are not eligible to be principal investigators

Source of Funding: *N/A*

Campus Address: *Rm 237 L HHP Building*

Email: *jhenning2@uncg.edu* Phone: *4-3694* Fax: *4-3238*

RANK: ☒ Faculty ☐ Other (specify):

If this project represents student work please provide the student researcher rank ☐ Undergraduate; ☐ Masters; or
☒ Doctoral

Student Researchers name: *Michelle M. Lesperance*
Email: *mlesperance@gborocollege.edu* Phone: *336-272-7102 x629* Fax: *336-271-6634*

Principal Investigator's Statement of Responsibility

As the principal investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Participants in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of a modification for its approval prior to implementation.

☒ The proposed research does not include any of the items that are listed in Item B of the Exemption Overview

Signature of Principal Investigator*

Date

12/17/07

Student Researcher's Statement of Responsibility

As a student researcher, I accept responsibility for ensuring that this project complies with all obligations listed above for the Principal Investigator.

Student Researcher*

Date

12/17/07

PLEASE COMPLETE AND DELIVER TWO (2) COPIES TO YOUR DEPARTMENTAL REVIEWER:

For IRB use only

☒ Exemption Granted

☐ Not Exempt, full protocol necessary

Exempt Under: ☒ b.1 ☒ b.2 ☐ b.3 ☐ b.6

IRB Reviewer

ORC Reviewer

Date

Date

Randy Schmit
[Signature]

12-18-07

1-8-08

RECEIVED
DEC 20 2007
ORC

Revised 6-19-07

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The effects of problem-based learning on students' critical thinking skills

Project Director: Michelle Lesperance, MS, ATC, LAT

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

We invite you to participate in a study that will investigate the effect of different teaching methods on critical thinking disposition and skill. There will be no additional items for you to complete if you decide to participate in the study. All the data that will be collected in the current study is part of your class assignments for ATH 1100. By agreeing to participate in this study, you are allowing us to include your scores on the California Critical Thinking Disposition Index (CCTDI), California Critical Thinking Skills test (CCTST), and your exam scores in the study. You will complete the CCTDI and CCTST at the beginning, middle and end of the semester during class time. The total time required to complete the CCTDI is approximately 20 minutes and the CCTST is a 45 minute timed test. In addition, we will be collecting your current GPA and the grades that you attained on exams in the class. None of this information will be looked at until after you have completed ATH 1100 and your final grade has been submitted. The instructor will not know who has agreed to participate in the study.

RISKS AND DISCOMFORTS:

There are no risks associated with participation in this study. The instructors will have no knowledge about whether or not you agree to participate in the study and none of the data will be analyzed until after final grades have been submitted for the class.

POTENTIAL BENEFITS:

There are no direct benefits to you for participating in this study. However, data from this study may be used to improve the instructional methods used in athletic training for future classes and will also provide information on changes in the critical thinking skills of students enrolled in athletic training courses.

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. The Research and Professional Development Subcommittee at Greensboro College has also approved this research and this consent form. Questions regarding the research itself will be answered by Michelle Lesperance by calling 272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are indicating that you are 18 years of age or older and are agreeing to participate in the project described to you by Robert Charles Lesperance, MS, ATC, LAT.

 Participant's Signature*

Date JAN 08 2008

APPROVED IRB

CONSENT FORM



THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

Office of Research Compliance

2718 Beverly Cooper Moore and Irene Mitchell Moore
Humanities and Research Administration Building
PO Box 26170, Greensboro, NC 27402-6170
336.256.1482 Phone 336.256.1482 Fax
www.uncg.edu/orc/

January 16, 2008

Dr. Jolene Henning
Exercise and Sports Science
237 HHP
Refer to: IRB No: 078178

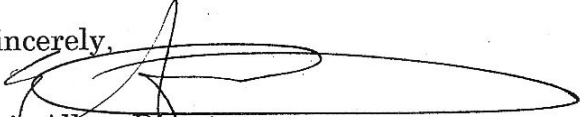
Dear Dr. Henning,

As required by University policy a member of the UNCG IRB has reviewed and approved your modification application to the protocol entitled "The Effect of Problem Based Learning on Students' Critical Thinking Skills" (IRB No. 078178). This modification allows or grants:

- Change in Participants - Adding control group participants of same caliber

You should be aware that any other changes in your protocol must be approved by the IRB prior to being implemented. Likewise, any unanticipated problems, complaints or adverse events that arise during the course of your project which involves human participants must be reported promptly to the Office of Research Compliance. The changes in this modification are valid for the duration of the study unless other changes are approved which circumvent this modification application approval. Thank you for your cooperation on this matter and best wishes on your project.

Sincerely,



Eric Allen, Director
Office of Research Compliance
Cc:

Principal Investigator HenningProtocol Number 078178

UNCG IRB Departmental Representative Approval

Minor changes to approved and currently active IRB protocols can be approved by the departmental IRB representative. Examples of these minor changes can be seen below.

<i>Type of Minor Change</i>	<i>Common Example</i>
<input type="checkbox"/> Adding student to protocol	NA
<input type="checkbox"/> Adding research sites	Additional school, class, or museum
X Adding participants of same caliber	NA
<input type="checkbox"/> Adding incentives for participants	Compensation for efforts that are not coercive
<input type="checkbox"/> Adding contractors or Aides	Transcribers, phlebotomist, or translators
<input type="checkbox"/> Change to consent form	Name change, use of long form vs. short form
<input type="checkbox"/> Participant risk reduction	Less time required, less blood required, or reduced intensity of exercise
<input type="checkbox"/> Changes to data collection method	Asking for email in addition to phone & address or administering survey in person vs. online

*Situations not listed above will be at the discretion of the IRB and will be explained below.

→ Central group participants

Approval by expedited review of IRB Department Representative

IRB Representative Signature

Randy Schmitz

IRB Representative Printed Name

Date

1-15-08

RECEIVED

JAN 16 2008

ORC

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The effects of problem-based learning on students' critical thinking skills

Project Director: Michelle Lesperance, MS, ATC, LAT

Participant's Name: _____

APPROVED IRB

JAN 15 2008

DESCRIPTION AND EXPLANATION OF PROCEDURES:

We invite you to participate in a study that will investigate the effect of this problem-based learning on critical thinking disposition and skill. There will be no additional items for you to complete if you decide to participate in the study. All the data that will be collected in the current study is part of your class assignments for ATH 1100 or ATH 2310, 3310 or 4310. By agreeing to participate in this study, you are allowing us to include your scores on the California Critical Thinking Disposition Index (CCTDI), California Critical Thinking Skills test (CCTST), and your exam scores in the study. You will complete the CCTDI and CCTST at the beginning, middle and end of the semester during class time. The total time required to complete the CCTDI is approximately 20 minutes and the CCTST is a 45 minute timed test. In addition, for students enrolled in ATH 1100 we will be collecting your current GPA and the grades that you attained on exams in the class. None of this information will be looked at until after you have completed ATH 1100, ATH 2310, 3310 or 4310 and your final grade has been submitted. The instructor will not know who has agreed to participate in the study. An additional group of students will participate voluntarily as a control group of Kinesiology students.

RISKS AND DISCOMFORTS:

There are no risks associated with participation in this study. The instructors will have no knowledge about whether or not you agree to participate in the study and none of the data will be analyzed until after final grades have been submitted for the class.

POTENTIAL BENEFITS:

There are no direct benefits to you for participating in this study. However, data from this study may be used to improve the instructional methods used in athletic training for future classes and will also provide information on changes in the critical thinking skills of students enrolled in athletic training courses.

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. The Research and Professional Development Subcommittee at Greensboro College has also approved this research and this consent form. Questions regarding the research itself will be answered by Michelle Lesperance by calling 272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are indicating that you are 18 years of age or older and are agreeing to participate in the project described to you by Robert Charles-Liscombe, EdD.

Participant's Signature* _____

Date _____

Principal Investigator HenningProtocol Number 078178

UNCG IRB Departmental Representative Approval

Minor changes to approved and currently active IRB protocols can be approved by the departmental IRB representative. Examples of these minor changes can be seen below.

<i>Type of Minor Change</i>	<i>Common Example</i>
<input type="checkbox"/> Adding student to protocol	NA
<input type="checkbox"/> Adding research sites	Additional school, class, or museum
<input type="checkbox"/> Adding participants of same caliber	NA
<input type="checkbox"/> Adding incentives for participants	Compensation for efforts that are not coercive
<input type="checkbox"/> Adding contractors or Aides	Transcribers, phlebotomist, or translators
<input type="checkbox"/> Change to consent form	Name change, use of long form vs. short form
<input type="checkbox"/> Participant risk reduction	Less time required, less blood required, or reduced intensity of exercise
<input type="checkbox"/> Changes to data collection method	Asking for email in addition to phone & address or administering survey in person vs. online

*Situations not listed above will be at the discretion of the IRB and will be explained below.

☐ Minor addition of subjective data from participants following the class

Approval by expedited review of IRB Department Representative

IRB Representative Signature

IRB Representative Printed Name

Date

Appendix C

Template for Problem Development

Template for Problem Development

Title:

Author: Michelle Lesperance, MS, ATC, LAT
Program Director, Athletic Training
Greensboro College
Greensboro, NC

Discipline: Athletic Training

Target Audience: Students enrolled in ATH 1100 B Prevention and Care of
Emergencies and Athletic Injuries

Keywords:

Length of Time/Staging:

Abstract: This problem enables students to examine

Date Printed:

Problem Content: Part 1
Part 2

Supporting Materials: Student Learning Objectives
Student Resources
Diagnosis and Solution Notes
Teaching Notes

Title:

Part I: Story/Background with Symptoms, Patient History, Physical Examination:

Using the Following Steps, develop a plan for this problem.

Identify the Problem	Define the context	Enumerate Choices	Learning Issues	Analyze options	Synthesize Information	Self evaluation
What are the real questions we are facing here?	What are the facts and circumstances that frame this problem? History of patient Signs/Symptoms Diagnostic Tests Define terms that you do not understand here. Be sure to cite references appropriately.	Evolving hypotheses: Based on signs/symptoms, what are our most plausible three or four options? Why?	What do you need to know to prove or disprove your hypothesis? What do you need to know before you solve the problem?	What is the best course of action? Now that you have more information, what is your diagnosis?	Why are you making this choice? Explain how you narrowed down your diagnosis	Is there anything you missed? Do you need more information?
	10 pts.	20 pts.	10 pts.	15 pts.	15 pts.	5 pts.

* You must include references in AMA style. For the preliminary report, this is worth 5 pts. For the final report, this is worth an additional 5 pts.

Questions will be worth 50 pts.

Gray section indicates information required for the preliminary group report.

White section indicates information required for the individual report.

**Part II: Additional Information
(Physical Exam)****Questions for students:**

- 1.
- 2.
- 3.

Student Learning Objectives

Title:

This problem was written with the following objectives in mind:

- 1.
- 2.
- 3.
- 4.
- 5.

Student Resources:

Students are encouraged to use a variety of resources for this problem. Some suggestions include:

Diagnosis and Solution Notes (These answers correspond to student questions and also additional information that may be helpful to the facilitator when helping students learn about the case)

Teaching Notes

Title:

Reviewer:

Feedback:

Appendix D
Instructional Plans

Problem Based Learning Assignments: (adapted from Robert B. Tallitsch, Augustana College, 2006 on PBL Clearinghouse, University of Delaware with permission)

- a. PBL Groups: Students will be randomly assigned to their PBL group. For **each** PBL problem, you will select a **different** group leader. The group leader will notify the instructor, via email or in person that they have been selected as the group leader. The group leader's role is defined below.
- b. Four times during the term, you will be assigned a PBL problem. For the first problem, you will only be graded on the questions so you can become familiar with the process of PBL and the information that I would like you to provide. Afterwards, each preliminary report (group) is worth 35 points and each final report (individual) is worth 65 points. There will also be questions assigned by the instructor worth 35 points. Any student who is absent from class on PBL work days will not be given credit for that part of the problem unless their information is submitted to the instructor before class.
- c. The problems are designed so that you will need to research and find information outside of class time. Not all of the answers can be found in your textbooks. You may need to use the library resources, web resources, journals, other textbooks, etc. Some resources are recommended with each problem.
- d. The PBL group will assign a group leader
 1. As mentioned above, each group will select a group leader. The leader will serve as the facilitator for group meetings. The leader is responsible for contacting members to arrange times to meet outside of class if necessary. At the initial meeting, group members will establish their groups' rules and expectations. Each group member will sign the form verifying that they have agreed to the groups' rules and expectations. You will submit these to the instructor, who will copy them and distribute them to group members.
 2. The group leader, along with other members of the group might choose to assign certain topics to individuals or you might choose certain responsibilities to assign to each individual (some responsibilities may include typist, editor, copy editor (proofreader). It is up to the group to determine what roles/responsibilities are needed.
 3. The group leader is the individual responsible for making sure all group members are participating adequately. If they aren't, it is the group leaders responsibility to contact the instructor immediately so that the issue can be resolved.
 4. The group leader is responsible for making sure the preliminary report is submitted on time and is complete.

- e. On the day the PBL problem is distributed in class, you will break up into groups and do some preliminary work on the problem in class. By the next class session, each individual will bring back the information that they were responsible for. At that session, you will share your information with your group and then together, you will write your group's preliminary report (use the problem solving steps format below). The preliminary report will be due at the next class session. Be sure to keep a copy of your report as a reference. The preliminary report (maximum 2 pages, references not included, typed, Times New Roman size 12 font, double spaced) must contain the following:
1. Identify the problem: What are the real questions you are facing? Typically this answers why is the person displaying these signs/symptoms?
 2. Define the context: What do you know? What are the facts and circumstances that frame this problem? In this section, you will also list terminology and definitions that you do not know. You must cite the sources of all of your information, including definitions. 10 pts.
 3. Enumerate choices: Based on the signs/symptoms at this point, what are your three or four most plausible options? In other words, what is the differential diagnosis (hypotheses)? Why? 10 pts.
 4. Learning Issues: This section includes information that you will need to know to narrow down your hypotheses. It will be a list of what you need to know before you solve the problem. 10 pts.
 5. Citations: All references must be cited in AMA style. If you are unfamiliar with AMA style, some sample citations are provided at the end of this information packet. For each problem set, you must use at least three resources. These resources may include websites, but you must have at least two resources that are not websites (i.e. your textbook, other textbooks, journals, medical dictionaries, etc.). The library has more than adequate references in hard copy (there are numerous "stacks" of books in the library!) and on the library website. If you are unfamiliar with the resources available in the library, I highly recommend you schedule an appointment with the reference librarian early in the semester. 5 pts.
- f. On the day the preliminary report is due, the second part of the problem will be handed out. **Each** individual in the group is required to submit a final report at the next class session (maximum of 5 pages in length, references not included).
1. Each individual in the group will choose one of the learning issues from the group's list and develop their own specific learning issues from that list. Each individual in your group will have different learning issues. These learning issues will be information that you want to know for your own learning process or to prove or disprove your hypotheses. They will be more elaborate than "understand anatomy of the heart". Instead, you would say, "understand the flow of blood through the heart". Then, you must answer your specific learning issues, in detail, so that you understand the questions you posed. This section includes information that you will need to know to narrow down your diagnoses. 20 pts.

2. Analyze Options: Now that you have more information, what is your diagnosis? 15 pts.
 3. Synthesize Information: If your preliminary hypothesis has changed at all, you must state how it has changed and why. If your preliminary hypothesis has not changed, you must state how the additional information has supported and clarified your preliminary hypothesis. You need to list reasons explicitly. Why are you making this choice? How did you narrow down your diagnosis? 20 pts.
 4. Self evaluation: Evaluate your performance. Is there anything you missed? Do you need more information? What would you do different next time? 5 pts.
 5. QUESTIONS: Answer all questions to the best of your ability. Do NOT simply cut and paste from the internet, this is unethical and unacceptable. The purpose of this assignment is to help you to retrieve information, critique available sources and make sure that you understand the questions asked and can explain the information. Do not plagiarize information from the internet. If you are unsure what plagiarism is, you may meet with me or the Writing Tutor, or refer back to your first year English classes. You are expected to adhere to the academic honor code from the College catalog. 35 pts.
 6. You MUST cite all resources in AMA style. 5 pts.
- h. NO late preliminary or final reports will be accepted. The schedule is set so that the instructor has adequate time to provide feedback to each team and individual. If you cannot make it to class, you MUST submit your report to the instructor before the scheduled class time.
 - i. At the end of the semester, all team members will complete the team assessment form to evaluate each member of your team and their level of participation. You will also evaluate yourself. These forms will have no impact on your grade in this class, instead they will help the instructor understand group dynamics.
 - j. Reference Resources: Each PBL problem will include a list of references that you may use for your problems. These references are simply suggestions and are in no way required for your problem.
 - k. AMA style of referencing requires that you use superscript numbers and cite all references at the end of the report. AMA reference examples are included below. (<http://www.liunet.edu/cwis/cwp/library/workshop/citama.htm>)

Book

1. Okuda M, Okuda D. *Star Trek Chronology: The History of the Future*. New York: Pocket Books; 1993.

Journal or Magazine Article (with volume numbers)

2. Wilcox RV. Shifting roles and synthetic women in Star trek: the next generation. *Stud Pop Culture*. 1991;13:53-65.

Newspaper, Magazine or Journal Article (without volume numbers)

3. Di Rado A. Trekking through college: classes explore modern society using the world of Star trek. *Los Angeles Times*. March 15, 1995:A3.

Book Article or Chapter

4. James NE. Two sides of paradise: the Eden myth according to Kirk and Spock. In: Palumbo D, ed. *Spectrum of the Fantastic*. Westport, Conn: Greenwood; 1988:219-223.

ERIC Document

5. Fuss-Reineck M. *Sibling Communication in Star Trek: The Next Generation: Conflicts Between Brothers*. Miami, Fla: Annual Meeting of the Speech Communication Association; 1993. ERIC Document Reproduction Service ED364932.

Website

6. Lynch T. DSN trials and tribble-ations review. Psi Phi: Bradley's Science Fiction Club Web site. 1996. Available at: <http://www.bradley.edu/campusorg/psiphi/DS9/ep/503r.htm>. Accessed October 8, 1997.

Journal Article on the Internet

7. McCoy LH. Respiratory changes in Vulcans during pon farr. *J Extr Med* [serial online]. 1999;47:237-247. Available at: http://infotrac.galegroup.com/itweb/nysl_li_liu. Accessed April 7, 1999.

Appendix E

Permission from Robert Tallitsch

INBOX Message

<http://prideemail.greensboro college.edu/Session/5589-7RwbBz5zZxP5fj...>

From: Bob Tallitsch <RobertTallitsch@augustana.edu>
Subject: Re: PBL Clearinghouse/PBL Problems
Date: Thu, 31 Jan 2008 15:39:21 -0000
To: "Michelle Lesperance" <mlesperance@greensboro college.edu>



Not a problem Michelle – feel free to utilize anything and everything you like. My format has evolved over the years, and it seems to work well although there is always something that can be/should be fixed.

I would be interested in reading your dissertation when it is completed – or even in its rough draft form. If there is anything I can do to help by all means ask, and I'll do it.

Bob

On Jan, 31 2008, , at 14:40, Michelle Lesperance wrote:

Dr. Tallitsch,
 I am currently a doctoral student at the University of North Carolina at Greensboro writing my dissertation entitled "The Use of PBL to Enhance Students' Critical Thinking Skills". When I began the process of understanding PBL, there were very few resources that I found on actual cases as well as how faculty evaluated performance of these cases. Since then, I came across your information on the UofDel Clearinghouse and your work has been extremely helpful to me as I've developed problems. Your cases are extremely thorough and undoubtedly required enormous work on your part. Thank you for your willingness to share your problems on line. I would like to formally request the use of your "template" as well as modified versions of your team/self assessment and self evaluation forms for use in my dissertation. I would of course cite you as a reference for all of the materials. I have included a case that I've developed for 1st year FSS majors using your template as well as the grading rubric that I will use in my research, if you are interested.

Please let me know if you have any questions/concerns regarding my research.

Cordially,
 Michelle Lesperance

Michelle Lesperance, MS, ATC
 Program Director, Athletic Training
 Assistant Professor, Division of Kinesiology
 Greensboro College

<Cardiovascular Problem, modified 120307.doc><Problem Based Learning Assignments.doc><Problem Solving Steps Grading Sheet.doc>

♻ Please consider the environment before printing this e-mail

Robert B. Tallitsch, Ph.D.
Professor of Biology
Augustana College

Appendix F

PBL Cases

Template for Problem Development

Title: Wow, that salsa did me in!

Author: Michelle Lesperance, MS, ATC, LAT
Program Director, Athletic Training
Greensboro College
Greensboro, NC

Discipline: Athletic Training

Target Audience: Students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries

Keywords: anatomy, cardiovascular conditions, myocardial infarction

Length of Time/Staging: 5 class periods

Abstract: This problem enables students to examine a medical condition in an individual complaining of pressure deep in his chest. Students will be exposed to an individual suffering from a cardiovascular condition and will be able to describe the two primary causes of coronary artery blockage.

Date Printed: 09/27/07

Problem Content: Part 1
Part 2

Supporting Materials: Questions for students, Student learning objectives, Student resources, Solution notes
(adapted from Medical Case Studies for the Paramedic by Stephen J. Rahm, NREMT-P; AAOS Jones and Bartlett Publishers, Boston 2004)

Title: Wow, that salsa did me in!

Part I: Story/Background (Include Patient History, Symptoms and Physical Examination)

You're covering a basketball game when a 47 year old male referee sits down on the bench during a time out. He states he doesn't feel well. You immediately notice that he has an apprehensive look on his face. He is clenching his fist against his chest and is noticeably diaphoretic. He is conscious and alert. He tells you that he ate Mexican food for lunch and that now he has really bad heartburn. He reports he feels sick to his stomach. His airway is patent and his respirations are normal. He has a strong and regular radial pulse. His skin is pale and cool to the touch.

Using the Following Steps, develop a plan for this problem.

Identify the Problem	Define the context	Enumerate Choices	Learning Issues (Group)	Learning Issues (Independent)	Analyze options	Synthesize Information	Self evaluation
What are the real questions we are facing here?	What are the facts and circumstances that frame this problem? History of patient Signs/Symptoms Diagnostic Tests Define terms that you do not understand here. Be sure to cite references appropriately. 10 pts.	Evolving hypotheses: Based on signs/symptoms, what are our most plausible three or four options? Why? 10 pts.	As a group, what have you decided you need to know to prove or disprove your hypothesis? (List) What do you need to know before you solve the problem? 10 pts.	As an individual, what have you identified as learning issues, what do you need to know in more detail to be able to narrow down your diagnosis? These must be specific and you must answer them. 20 pts.	Now that you have more information, what is your diagnosis? 15 pts.	Why are you making this choice? Explain how you narrowed down your diagnosis 20 pts.	Is there anything you missed? Do you need more information? 5 pts.

* You must include references in AMA style. For the preliminary report, this is worth 5 pts. For the final report, this is worth an additional 5 pts.

Questions will be worth 35 pts.

Gray section indicates information required for the preliminary group report.

White section indicates information required for the final individual report.

Part II: Additional Information (physical exam, vital signs, past medical history)

You question him further and find out that he has chest pain that began suddenly and that nothing he does relieves the pressure. He tells you that the pain is primarily in his chest and rates the pain “7” on a scale of 0-10. He says he took 3 sprays of nitroglycerin but it did not help with the pressure. You perform a chest exam and note no obvious trauma. The chest wall moves symmetrically. His breath sounds are clear and equal bilaterally. His jugular veins appear normal.

Additional information:

BP is 134/84 mmHg

Respirations = 18 breaths per min and labored, he c/o shortness of breath

Signs/symptoms = chest pressure, diaphoresis, nausea

Allergies = codeine and penicillin

Medications = atenolol (Tenormin) and nitroglycerin

Pertinent past history = hypertension and angina pectoris

Last oral intake = Mexican food ~ 2 hours ago

Events leading up to injury = running down the court

EKG shows an elevated ST segment

Blood tests show elevated cardiac enzymes

Questions for students:

1. Based on the above information, what condition(s) do you suspect? Why? What other conditions could be occurring? Why?

2. What is occurring pathologically when an individual complains of chest pain and/or pressure in the chest?

3. Trace the blood flow through the heart. What is occurring when the LUB/DUB sounds are heard?
What is occurring when the LUB/DUB sounds are not heard?

4. If left untreated, what is the likely prognosis? (besides the obvious, death)

5. When would CPR be warranted in this situation? When would you use an AED?

6. What factors contribute to this condition? Which of these can be prevented? Which cannot be prevented?

Student Learning Objectives

Title: Wow, that salsa did me in!

This problem was written with the following objectives in mind:

1. To comprehend the anatomy of the heart and synthesize the information to explain what is occurring with a myocardial infarction.
2. Analyze why it is important to perform a primary and secondary assessment on a patient
3. Differentiate between medical conditions that cause pain in the chest
4. Describe and know when to refer cardiovascular conditions
5. Explain the two primary causes of coronary artery blockage
6. Describe signs/symptoms of individuals suffering from myocardial infarction

Student Resources:

Students are encouraged to use a variety of resources for this problem. Some suggestions include:

Pollack, A. *First Responder: Your First Response in Emergency Care*, 4th edition, Massachusetts: Jones and Bartlett; 2007.

Thygerson, A *First Aid, CPR and AED*, 5th edition. Boston: Jones and Bartlett; 2007

Gulli, B *Professional Rescuer CPR*, 3rd edition. Boston: Jones and Bartlett; 2007

Solution Notes

Information

This individual is suffering from myocardial infarction. He has a history of angina pectoris and has been prescribed nitroglycerin to relieve the pain. This time, the nitroglycerin does not relieve the pressure.

Answers to student questions

1. Based on the above information, what condition(s) do you suspect? Why? What other conditions could be occurring? How did you rule those out?

Myocardial infarction. Signs/symptoms of chest pressure, nausea, diaphoresis are consistent with myocardial infarction.

Other conditions that could be occurring could be angina pectoris, GERD.

Acid reflux (or GERD gastroesophageal reflux disease) has the following symptoms:

- A burning feeling in the chest just behind the breastbone that occurs after eating and lasts a few minutes to several hours.
- Chest pain, especially after bending over, lying down or eating.
- Burning in the throat -- or hot, sour, acidic or salty-tasting fluid at the back of the throat.
- Difficulty swallowing.
- Feeling of food "sticking" in the middle of the chest or throat.
- Heartburn may cause chronic cough, sore throat, or chronic hoarseness.

Often, the pain caused by a heart attack and during a severe heartburn episode is difficult to distinguish.

Possible signs of heartburn that could be mistaken for a heart attack include:

- A sharp, burning sensation just below the breastbone or ribs.
- Pain generally does not radiate to the shoulders, neck, or arms, but it can.
- Pain usually comes after meals, when lying on the back, when exercising or when experiencing anxiety.
- Symptoms usually respond quickly to antacids.
- Rarely accompanied by a cold sweat.

Possible signs of angina (severe pain in chest area) or heart attack:

- A feeling of fullness, tightness, or dull pressure or pain generally in the center of the chest.
- The feeling of a belt being tightened around your chest.
- Sudden chest pain or pressure that worsens.
- Dizziness.

- Pain may spread to the shoulders, neck, jaw or arms.
- Pain often responds quickly to nitroglycerin.
- Shortness of breath.
- Often accompanied by a cold sweat.
- Possible lightheadedness.

2. What is occurring anatomically when an individual has a myocardial infarction? Why?

With a myocardial infarction, one or more of the coronary arteries is completely blocked. The two primary causes of coronary artery blockage are severe arteriosclerosis and a blood clot from somewhere else in the circulatory system that has broken free and become lodged in the artery. If one of the coronary arteries becomes blocked, the part of the heart muscle served by the artery is deprived of oxygen and dies.

3. Trace the blood flow through the heart. What is occurring when the LUB/DUB sounds are heard?

What is occurring when the LUB/DUB sounds are not heard?

The right and left sides of the heart work together. The pattern described below is repeated over and over, causing blood to flow continuously to the heart, lungs and body.

Right side

- Blood enters the heart through the inferior and superior vena cava, emptying oxygen-poor blood from the body into the right atrium.
- As the atrium contracts, blood flows from the right atrium into the right ventricle through the open tricuspid valve.
- When the ventricle is full, the tricuspid valve shuts. This prevents blood from flowing backward into the atria while the ventricle contracts.
- As the ventricle contracts, blood leaves the heart through the pulmonic valve, into the pulmonary artery and to the lungs where it is oxygenated.

Left side

- The pulmonary vein empties oxygen-rich blood from the lungs into the left atrium.
- As the atrium contracts, blood flows from your left atrium into your left ventricle through the open mitral valve.
- When the ventricle is full, the mitral valve shuts. This prevents blood from flowing backward into the atrium while the ventricle contracts.

- As the ventricle contracts, blood leaves the heart through the aortic valve, into the aorta and to the body.

The lub dub sounds are produced when the heart valves close. The first heart sound or "lub" results from closure of the tricuspid and mitral valves. It is a rather low-pitched and a relatively long sound which, as indicated in, represents the beginning of ventricular systole. The second heart sound, or "dub," marks the beginning of ventricular diastole. It is produced by closure of the aortic and pulmonary semilunar valves when the intraventricular pressure begins to fall. This "dub" sound is typically heard as a sharp snap because the semilunar valves tend to close much more rapidly than the AV valves. Because diastole occupies more time than systole, a brief pause occurs after the second heart sound when the heart is beating at a normal rate. Therefore, the pattern that one hears is one of: "lub-dub" pause, "lub-dub" pause, and so on.

The heart is in aystole when you cannot hear the lub-dub sounds.

4. If left untreated, what would the prognosis be? Cardiac arrest and/or death. Other situations that could occur would be scarring of the myocardium, pericarditis, prolonged angina.

5. When would CPR be warranted in this situation? When would you use an AED?

CPR is used when the heart is in asystole, however many times an individual cannot determine this. If the heart is in ventricular fibrillation, the use of an AED is warranted. New guidelines require 2 minutes of CPR before additional shocks are given. If the AED determines the heart is in fibrillation, it will initiate a shock.

5. What factors contribute to myocardial infarction? Which of these can be prevented? Which cannot be prevented?

Smoking, Diet (Eat a diet low in fat and cholesterol, increase vitamins, especially antioxidants, which have been proven to lower your risk for heart disease), lack of exercise (activity level), body weight (excess weight puts significant strain on your heart and worsens several other heart disease risk factors such as diabetes. Researchers now know that obesity itself increases heart disease risk), cholesterol level (The risk for heart disease increases as your total amount of cholesterol increases. A total cholesterol level over 200, a HDL, or "good" cholesterol level under 40, or a LDL, or "bad" cholesterol level over 160 indicates an increased risk for heart disease), blood pressure and stress. Other factors which cannot be prevented are age, gender, nationality.

Other information that may be helpful to the facilitator:

1. What does an elevated ST segment indicate?

ST segment elevation is usually attributed to impending infarction, but can also be due to pericarditis or vasospastic (variant) angina.

- The P wave is associated with the contractions of the atria
- The QRS is a series of waves associated with ventricular contractions
- T and U waves follow the ventricular contractions.

Elevated ST segments are strong indicators of a heart attack in patients with symptoms and other indicators. They suggest that an artery to the heart is blocked and that the full thickness of the heart muscle is damaged. When this finding coincides with a heart attack, the condition is sometimes referred to as either as a Q-wave myocardial infarction or a STEMI (ST-segment elevation myocardial infarction). STEMI heart attacks are very severe and usually have complete artery blockage. ST-elevations are strong indicators for aggressive treatments (thrombolytic drugs or angioplasty) to reopen blood vessels. Some patients do not have elevated ST segments, so other factors (physical examination and ECG results) must be examined.

(http://www.healthcentral.com/heart-disease/heart-attack-000012_5-145.html)

2. What do elevated cardiac enzymes indicate?

Cardiac enzyme studies are used to measure the levels of the enzymes (TnI, TnT) and creatine phosphokinase (CPK, CK) in the blood. Low levels of these enzymes are normally found in your blood, but if the heart muscle is injured, the enzymes leak out of damaged heart muscle cells and their levels in the bloodstream rise.

Because some of these enzymes are also found in other body tissues, their levels in the blood may rise when those other tissues are damaged. Physicians will compare cardiac enzyme results with other results such as your physical examination and those from the electrocardiogram. Accessed at www.webmd.com

3. Atenolol is a beta-adrenergic blocking agent. Atenolol blocks the action of the sympathetic nervous system. The sympathetic nervous system stimulates the pace of the heart beat. By blocking the action of these nerves, atenolol reduces the heart rate and is useful in treating abnormally rapid heart rhythms. Atenolol also reduces the force of heart muscle contraction and lowers blood pressure. By reducing the heart rate and the force of muscle contraction, atenolol reduces heart muscle oxygen demand. Since angina occurs when oxygen demand of the heart exceeds supply, atenolol is helpful in treating angina. Atenolol is the generic name for the drug. Tenormin is the brand name of the drug. Accessed at <http://www.medicinenet.com/atenolol/article.htm>

4. Nitroglycerin relaxes blood vessels allowing more blood to flow through. This reduces the workload on the heart and improves blood flow to the heart. Lingual (spray) nitroglycerin acts quickly to relieve chest pain. Accessed at http://www.medicinenet.com/nitroglycerin_lingual_spray/article.htm

For the reviewer:

Teaching Notes: What is your impression of this case? Would you change or add/delete any information provided? Do you feel that this case meets the objectives established

Template for Problem Development

Title: Ouch! He stung me!

Author: Michelle Lesperance, MS, ATC, LAT
Program Director, Athletic Training
Greensboro College
Greensboro, NC

Discipline: Athletic Training

Target Audience: Students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries

Keywords: anaphylaxis, respiratory distress

Length of Time/Staging: 5 class periods

Abstract: This problem enables students to understand what occurs with anaphylaxis.

Date Printed: September 19, 2007

Problem Content: Part 1
Part 2

Supporting Materials: Questions for students, Student learning objectives, Student resources, Solution notes
(adapted from Medical Case Studies for the Paramedic by Stephen J. Rahm, NREMT-P; AAOS Jones and Bartlett Publishers, Boston 2004)

Title:**Part I: Story/Background**

You are covering a women's lacrosse practice when you notice one of the players sitting on the bench. She is in obvious respiratory distress and is covered with a rash. Her respirations are labored; however she has adequate tidal volume and is able to speak to you in full sentences.

Your initial assessment includes:

Level of consciousness: conscious but restless

Chief complaint: She is having trouble breathing.

Airway and Breathing: Airway is patent, audible wheezing is heard, and respirations are labored but with adequate tidal volume.

Circulation: Pulse is weak and rapid; skin is diaphoretic with a generalized rash.

Using the Following Steps, develop a plan for this problem.

Identify the Problem	Define the context	Enumerate Choices	Learning Issues (Group)	Learning Issues (Independent)	Analyze options	Synthesize Information	Self evaluation
What are the real questions we are facing here?	What are the facts and circumstances that frame this problem? History of patient Signs/Symptoms Diagnostic Tests Define terms that you do not understand here. Be sure to cite references appropriately.	Evolving hypotheses: Based on signs/symptoms, what are our most plausible three or four options? Why?	As a group, what have you decided you need to know to prove or disprove your hypothesis? (List) What do you need to know before you solve the problem?	As an individual, what have you identified as learning issues, what do you need to know in more detail to be able to narrow down your diagnosis? These must be specific and you must answer them.	Now that you have more information, what is your diagnosis?	Why are you making this choice? Explain how you narrowed down your diagnosis	Is there anything you missed? Do you need more information?
	10 pts.	10 pts.	10 pts.	20 pts.	15 pts.	20 pts.	5 pts.

* You must include references in AMA style. For the preliminary report, this is worth 5 pts. For the final report, this is worth an additional 5 pts. Questions will be worth 35 pts.

Gray section indicates information required for the preliminary group report.

White section indicates information required for the final individual report.

Part II: Additional Information

You continue to ask her history questions and find she has a history of allergies to hornets, bees and fire ants. She tells you that she was stung by a hornet approximately 15 minutes ago and immediately after she noticed the rash on her skin. She c/o difficulty breathing.

BP = 100/70 mm Hg

Pulse = 132 bpm, strong and regular

Respirations = 22 breaths per minute, slightly labored

Signs and symptoms = respiratory distress, hives, facial swelling

Allergies = "I am not allergic to any medications, but I am allergic to hornets, bees and fire ants."

Medications = "I have an Epi pen but it is expired."

Pertinent past history = "I do not have any other medical problems."

Last oral intake = "I ate lunch about 2 hours ago."

Events leading to present illness = "I was stung by a hornet"

Questions for students:

1. What are the causes of anaphylaxis?

2. Are there any other possible conditions besides anaphylaxis that may explain this patient's symptoms?

3. Describe the treatment for an individual suffering from anaphylaxis.

4. If a patient has an expired Epi-pen, should you administer it anyway? Why or why not?

5. Will this patient require further evaluation by a physician? Should she be transported by ambulance or by car? Does it require immediate action or should you wait until practice has ended?

Student Learning Objectives

Title: Ouch, it stung me!

This problem was written with the following objectives in mind:

1. The student will identify the signs, symptoms, possible causes, and proper management of an allergic reaction to insect bites
2. Students will implement appropriate emergency treatment strategies, including administration of an EpiPen for anaphylactic shock
3. Students will be able to perform a secondary assessment and employ the appropriate management techniques for an allergic reaction to an insect bites.

Student Resources:

Students are encouraged to use a variety of resources for this problem. Some suggestions include:

1. Pollack, A. *First Responder: Your First Response in Emergency Care*, 4th edition, Massachusetts: Jones and Bartlett; 2007.
2. Thygerson, A *First Aid, CPR and AED*, 5th edition. Boston: Jones and Bartlett; 2007
3. Gulli, B *Professional Rescuer CPR*, 3rd edition. Boston: Jones and Bartlett; 2007
4. American Academy of Allergy, Asthma and Immunology Board of Directors, Anaphylaxis in schools and other child-care settings, *J Allergy Clin Immunol* 102 (1998), pp. 173–176.
5. (Suppl)R.A. Nicklas, I.L. Bernstein, J.T. Li, R.E. Lee, S.L. Spector and M.S. Dykewicz *et al.*, Joint Council of Allergy, Asthma, and Immunology Practice Parameters. The diagnosis and management of anaphylaxis, *J Allergy Clin Immunol* 101 (1998), pp. S465–S528.
6. G. Hughes and P. Fitzharris, Managing acute anaphylaxis: new guidelines emphasize importance of intramuscular adrenaline, *BMJ* 319 (1999), pp. 1–2.
7. Project Team of the Resuscitation Council (UK), Emergency medical treatment of anaphylactic reactions, *J Accid Emerg Med* 16 (1999), pp. 243–247.
8. *Physicians' desk reference* (53rd ed.), Medical Economics, Montvale (NJ) (1999), pp. 916–917.
9. H.A. Sampson, L. Mendelson and J.P. Rosen, Fatal and near-fatal anaphylactic reactions to food in children and adolescents, *N Engl J Med* 327 (1992), pp. 380–384.

Answers to Student Questions:

1. What are the causes of anaphylaxis?

Food, medications, insect venom, latex and exercise (exercise induced anaphylaxis)

2. Are there any other possible conditions besides anaphylaxis that may explain this patient's symptoms?

Possibilities: asthma, stress, etc.

- Urticaria (hives)
- Difficulty breathing or swallowing, wheezing, facial and upper airway swelling
- Hypotension and tachycardia typically within minutes following exposure.
- A metallic taste or itching in the mouth
- Generalized flushing, itching, or redness of the skin
- Abdominal cramps, nausea, vomiting, or diarrhea
- Rapidly decreasing blood pressure (and accompanying paleness)
- A sudden feeling of weakness
- Anxiety or an overwhelming sense of doom
- Collapse
- Loss of consciousness

3. Describe the treatment for a patient suffering from anaphylaxis.

Thygerson, *A First Aid, CPR and AED, 5th edition*. Boston: Jones and Bartlett; 2007

Monitor breathing and give CPR if necessary

Call 9-1-1

If victim has epinephrine, help him administer it

Give antihistamine (Benadryl) to prevent further reactions

Keep a responsive victim sitting up to help breathing; place an unresponsive victim in recovery position

4. If a patient has an expired Epi-pen, should you administer it anyway? Why or why not?

Simons, E. Xiaochen, G. and Simons, K. Outdated EpiPen and EpiPen Jrautoinjectors: Past their prime? *Journal of Allergy and Clinical Immunology*, 105 (5), May 2000, Pages 1025-1030

If that is all that is available, there may be some medication left. In a recent study of outdated EpiPens found their effectiveness dramatically reduced. The medicine in most of the expired devices looked normal and didn't appear discolored, nor were there any precipitates. The epinephrine in these out-dated injectors had lost some or all of its potency. The more out-dated the injector, the less active epinephrine it contained. The authors recommend that EpiPen users check the expiration date of their pens and replace any that have expired. However, if the only available EpiPen has expired, and a shot of epinephrine is needed, use it anyway. Although the epinephrine dose may be less than optimal, there may be enough active epinephrine to provide some help. The authors also mention that proper storage of EpiPens will extend their useful life. Heat is very destructive to epinephrine. Keeping EpiPens in a cool place is best, but most important is to have an EpiPen available when it's needed.

5. Will this patient require further evaluation by a physician? Should she be transported by ambulance or by car? Does it require immediate action or should you wait until practice has ended?

This patient may require further evaluation by a physician. Because epinephrine constricts blood vessels, it may cause the patient's blood pressure to rise significantly. Other side effects include tachycardia, pallor, dizziness, chest pain, headache, nausea and vomiting. Anaphylaxis is a life threatening conditioning and therefore she should be transported to the hospital via ambulance immediately.

For the reviewer:

Teaching Notes: What is your impression of this case? Would you change or add/delete any information provided?

Do you feel that this case meets the objectives established?

Template for Problem Development

Title: Did I make the play?

Author: Michelle Lesperance, MS, ATC, LAT
Program Director, Athletic Training
Greensboro College
Greensboro, NC

Discipline: Athletic Training

Target Audience: Students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries

Keywords: concussion, spinal cord injury, subdural hematoma, epidural hematoma

Length of Time/Staging: 4 class sessions

Abstract: This problem enables students to examine head injuries.

Date Printed: November 30, 2007

Problem Content: Part 1
Part 2

Supporting Materials: Questions for students, Student learning objectives, Student resources, Solution notes

Title:**Part I: Story/Background**

You're covering a men's lacrosse game when an athlete suffers a coup injury from direct contact with a lacrosse stick and falls to the ground. You run onto the field and find the athlete prone on the field. You immediately maintain cervical spine stabilization. Once you determine he is unconscious, you summon the help of your staff and logroll him over. Once the athlete is supine, you begin a primary assessment. The assistant athletic trainer proceeds to remove the facemask with the FM Extractor. He checks his airway, it is patent and his breathing is shallow. He checks for a pulse and finds a strong, bounding pulse (100 bpm). You notify security to call 911.

Using the Following Steps, develop a plan for this problem.

Identify the Problem	Define the context	Enumerate Choices	Learning Issues (Group)	Learning Issues (Independent)	Analyze options	Synthesize Information	Self evaluation
What are the real questions we are facing here?	What are the facts and circumstances that frame this problem? History of patient Signs/Symptoms Diagnostic Tests Define terms that you do not understand here. Be sure to cite references appropriately. 10 pts.	Evolving hypotheses: Based on signs/symptoms, what are our most plausible three or four options? Why? 10 pts.	As a group, what have you decided you need to know to prove or disprove your hypothesis? (List) What do you need to know before you solve the problem? 10 pts.	As an individual, what have you identified as learning issues, what do you need to know in more detail to be able to narrow down your diagnosis? These must be specific and you must answer them. 20 pts.	Now that you have more information, what is your diagnosis? 15 pts.	Why are you making this choice? Explain how you narrowed down your diagnosis 20 pts.	Is there anything you missed? Do you need more information? 5 pts.

* You must include references in AMA style. For the preliminary report, this is worth 5 pts. For the final report, this is worth an additional 5 pts. Questions will be worth 35 pts.

Gray section indicates information required for the preliminary group report.

White section indicates information required for the final individual report.

Part II: Additional Information

The athlete starts to open his eyes and appears very confused. He asks if he scored a goal. You tell him that he was hit with a stick and he tries to sit up. You quickly reassure him that you are just taking precautions to make sure everything is ok first. From this conversation, you rate him as a V on the AVPU scale. You perform a secondary survey which consists of ongoing vital sign assessment, a history, cranial nerve assessment, and questions related to OMIT (Orientation (to person, place and time), Memory (retrograde and anterograde), Intelligence (lower level, upper level and reasoning), and Talk (level of conversation, similar to Glasgow Coma Scale)).

Student Learning Objectives

Title: Did I make the play?

This problem was written with the following objectives in mind: (NATA Education Council 4th edition Competencies)

1. Identify the signs and symptoms of head trauma, including loss of consciousness, changes in standardized neurological function, cranial nerve assessment, and other symptoms that indicate underlying trauma.
2. Explain the importance of monitoring a patient following a head injury, including obtaining clearance from a physician before further patient participation.
3. Define cerebral concussion, list the signs and symptoms of concussions, identify the methods for determining the neurocognitive status of a patient who sustains a concussion and describe contemporary concepts for the management and return-to-participation of a patient who sustains a concussion.
4. Describe cervical stabilization devices that are appropriate to the circumstances of an injury.
5. Describe the indications, guidelines, proper techniques and necessary supplies for removing equipment and clothing in order to evaluate and/or stabilize the involved area.
6. Describe the effective management, positioning, and immobilization of a patient with a suspected spinal cord injury.
7. Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:
 - b. Closed-head trauma (using standard neurological tests and tests for cranial nerve function)
 - i. Spinal cord and peripheral nerve injuries
8. Identify and describe basic components of a comprehensive emergency plan for the care of acutely injured or ill patients, which include (1) emergency action plans for each setting or venue; (2) personnel education and rehearsal; (2) emergency care supplies and equipment appropriate for each venue; (3) availability of emergency care facilities; (4) communication with onsite personnel and notification of EMS; (5) the availability, capabilities, and policies of community-based emergency care facilities and community-based managed care systems; (6) transportation; (7) location of exit and evacuation routes; (8) activity or event coverage; and (9) record keeping.

Questions for Students:

1. What is the suspected diagnosis for this athlete? Why do you suspect this diagnosis?
2. Which cranial nerves, if any, are affected with this condition? Where are these nerves located?
3. What is the immediate first aid that you would provide to this athlete? Would you use a cervical stabilization device? Why?
4. Briefly describe an EAP for this event and be sure that the injury you suspect is considered.
5. What methods could you use to determine this athlete's neurocognitive status on the sidelines? What are the return to play guidelines for this diagnosis? Refer to the NATA Position Statement as necessary.
6. How would your assessment plan change if you determine that the cervical spine is also injured?
7. Differentiate between different types of head injuries (i.e. cerebral concussion, subdural and epidural hematoma). How will the athlete likely react with each of these injuries? How would your assessment strategy and plan of care differ for each of these?

Student Resources:

Students are encouraged to use a variety of resources for this problem. Some suggestions include:

1. Guskiewicz KM, Bruce SL, Cantu RC, et al. National athletic trainers' association position statement: Management of sport-related concussion. *Journal of Athletic Training*. 2004;39(3):280-297.
2. Guskiewicz KM. The concussion puzzle: 5 compelling questions. *Journal of Athletic Training*. 2001;36(3):225-226.
3. Prentice, W *Athletic Training: An Introduction to Professional Practice*. Boston: McGraw Hill; 2006
4. Thygeson, A *First Aid, CPR and AED, 5th edition*. Boston: Jones and Bartlett; 2007
5. Shultz, S. *Examination of Musculoskeletal Injuries, 2nd edition*. Illinois: Human Kinetics; 2005

Solution Notes:

(Shultz, S. *Examination of Musculoskeletal Injuries*, 2nd edition. Illinois: Human Kinetics; 2005)

1. What is the suspected diagnosis for this athlete? Why do you suspect this diagnosis? This individual is suffering from a concussion (a coup injury, meaning a direct hit). A concussion is a transient alteration in brain function without structural damage. It is caused by agitation or shaking of the brain.

2. Which cranial nerves, if any, are affected with this condition? Where are these nerves located?

There are 12 paired cranial nerves that are numbered from anterior to posterior, according to where they are attached to the brain. The cranial nerves provide sensory and motor innervation for the head, neck, thorax and abdomen.

1. Olfactory: smell
2. Optic: peripheral vision, papillary reflex to light
3. Oculomotor: pupil size, eyelid movement (raise eyelids), eye movement (look up and in)
4. Trochlear: eye movement (look down and toward nose)
5. Trigeminal: teeth clenching, side to side jaw movement
6. Abducens: lateral eye movement
7. Facial: expression (wrinkle forehead, smile, frown)
8. Vestibulocochlear: tinnitus, hearing, equilibrium
9. Glossopharyngeal: sense of taste, gag reflex
10. Vagus: voice quality
11. Spinal accessory: shoulder shrug
12. Hypoglossal: tongue movement (stick tongue movement)

3. What is the immediate first aid that you would provide to this athlete? Would you use a cervical stabilization device? Why?

Establish level of consciousness, examine vital signs (respirations, pulse, blood pressure (increase in BP indicates intracranial hemorrhage) Important to stabilize head and neck, especially if athlete is unconscious.

4. Briefly describe an EAP for this event and be sure that the injury you suspect is considered.

Everyone should know their role ahead of time so that the situation runs smoothly.
Remove facemask. Transport via spine board.

5. What methods could you use to determine this athlete's neurocognitive status on the sidelines? What are the return to play guidelines for this diagnosis? Refer to the NATA Position Statement as necessary.

SAC test. Athletes should be completely symptom free before being allowed to participate. Most clinicians like to make individual decisions based on individual assessment. Minimum time frame recommended is 7 days.

6. How would your assessment plan change if you determine that the cervical spine is also injured?

Stabilize, monitor vital signs, upper and lower extremity neurological assessments

7. Differentiate between different types of head injuries (i.e. cerebral concussion, subdural and epidural hematoma). How will the athlete likely react with each of these injuries? How would your assessment strategy and plan of care differ for each of these? Concussion is caused by agitation or shaking of the brain. It is defined as a transient alteration in brain function without structural damage. Clinically, it is defined by severity of the injury. Classified by loss of consciousness, amnesia.

Intracranial hemorrhage: When pressure builds up in intracranial space, the contents shift down to the tentorial notch (the only opening). This compresses the brain stem, the center for breathing, heart rate and other life sustaining functions. Pressure must be relieved or death will result. Vital signs demonstrate HBP, decreased pulse rate, and changes in respiration. Cheyne-Stokes respiration, characterized by fluctuations in breathing, alternating between hyperpnea and apnea. Rapid, shallow breathing, hypotension and rapid pulse. With increase in pressure, pupillary changes lead to pupil inequality and non-reactive to light. Individuals may demonstrate muscle weaknesses up to paralysis. Decorticate posturing, injury above brain stem. Decerebrate posturing, upper brain stem injury. + Babinski sign: lower brain stem injury.

Subdural hematoma: bleeding in the subdural space.

Epidural hematoma: tears the middle meningeal artery, resulting in rapidly expanding hematoma.

Skull fracture: direct impact. Pain, palpable tenderness, swelling, discoloration, deformity, raccoon eyes, battle sign, rhinorrhea, otorrhea

Teaching Notes: What is your impression of this case? Would you change or add/delete any information provided?

Do you feel that this case meets the objectives established?

Template for Problem Development

Title: Why do I feel so crappy?

Author: Michelle Lesperance, MS, ATC, LAT
Program Director, Athletic Training
Greensboro College
Greensboro, NC

Discipline: Athletic Training

Target Audience: Students enrolled in ATH 1100 Prevention and Care of Emergencies and Athletic Injuries

Keywords: hypoglycemia, hyperglycemia, diabetes

Length of Time/Staging: 2 class sessions

Abstract: This problem enables students to examine diabetic conditions such as hypoglycemia and hyperglycemia and recognize the differences between the two conditions. Students should be able to recognize the signs and symptoms of a diabetic emergency and initiate appropriate first aid treatment for the individual.

Date Printed: September 17, 2007

Problem Content: Part 1
Part 2

Supporting Materials: Questions for students, Student learning objectives, Student resources, Solution notes
(adapted from Medical Case Studies for the Paramedic by Stephen J. Rahm, NREMT-P; AAOS Jones and Bartlett Publishers, Boston 2004)

Title:**Part I: Story/Background**

You are headed to lunch when a student approaches you to tell you he doesn't feel well. He appears disoriented and complains that he is weak, thirsty and his stomach hurts. His airway is patent. Respirations are increased but the patient has an adequate tidal volume. The radial pulse is weak, irregular and increased. His skin is warm and dry with poor turgor

According to the patient, he reports that he has felt this way for approximately 3 days and it has progressively gotten worse. He reports polyuria and an increase in dizziness. He has no evidence of trauma or identifiable mechanism of injury. His oral temp is 101.5. His pupils are equal and reactive to light.

Using the Following Steps, develop a plan for this problem.

Identify the Problem	Define the context	Enumerate Choices	Learning Issues (Group)	Learning Issues (Independent)	Analyze options	Synthesize Information	Self evaluation
What are the real questions we are facing here?	What are the facts and circumstances that frame this problem? History of patient Signs/Symptoms Diagnostic Tests Define terms that you do not understand here. Be sure to cite references appropriately. 10 pts.	Evolving hypotheses: Based on signs/symptoms, what are our most plausible three or four options? Why? What do you need to know before you solve the problem? 10 pts.	As a group, what have you decided you need to know to prove or disprove your hypothesis? (List) What do you need to know before you solve the problem? 10 pts.	As an individual, what have you identified as learning issues, what do you need to know in more detail to be able to narrow down your diagnosis? These must be specific and you must answer them. 20 pts.	Now that you have more information, what is your diagnosis? 15 pts.	Why are you making this choice? Explain how you narrowed down your diagnosis 20 pts.	Is there anything you missed? Do you need more information? 5 pts.

* You must include references in AMA style. For the preliminary report, this is worth 5 pts. For the final report, this is worth an additional 5 pts. Questions will be worth 35 pts.

Gray section indicates information required for the preliminary group report.

White section indicates information required for the final individual report.

Part II: Additional Information

The patient's vital signs include:

BP: 88/56 mm Hg

Pulse: 110 bpm and irregular; weak at the radial site

Respirations: 26 breaths per minute with adequate tidal volume

Blood Glucose: Measures at 350 mg/dL

Allergies to Demerol and Motrin

Medications: Proscar

Pertinent past history: "I had a heart infection a few years ago. I also have an enlarged prostate."

Last oral intake: "I don't remember when I last ate but I've been really thirsty"

Events leading to present illness: "I have been sick for about 3 days. This all began when my stomach started hurting"

As you continue to talk to him, you notice he is becoming increasingly disoriented and confused. You notice an acetone smell on his breath.

Questions for students:

1. Based upon these findings, what is the suspected diagnosis?
2. What conditions can occur simultaneously with this diagnosis?
3. Why might this patient have polyuria?
4. Based on your suspected diagnosis, what is occurring physiologically when an individual suffers from this condition?

Student Learning Objectives

Title: Why do I feel so crappy?

This problem was written with the following objectives in mind:

1. The student will be able to identify signs, symptoms, possible causes and proper management of diabetic coma
2. The student will be able to perform a secondary assessment and administer appropriate first aid techniques for an individual suffering from diabetic coma.
3. Students should be able to explain what is occurring physiologically when individuals suffer from diabetic coma

Student Resources:

Students are encouraged to use a variety of resources for this problem. Some suggestions include:

Pollack, A. *First Responder: Your First Response in Emergency Care*, 4th edition, Massachusetts: Jones and Bartlett; 2007.

Thygerson, A *First Aid, CPR and AED*, 5th edition. Boston: Jones and Bartlett; 2007

Gulli, B *Professional Rescuer CPR*, 3rd edition. Boston: Jones and Bartlett; 2007

Answers to Student Questions:

1. Based on signs/symptoms, what is the suspected diagnosis?

Hyperglycemia

Elevated blood glucose levels

Rapid breathing and acetone breath

Polyuria

Polydipsia

Poor skin turgor

Tachycardia

2. What conditions can occur simultaneously with hyperglycemia?

Diabetic ketoacidosis (DKA) is also referred to as diabetic coma. It is a complication of insulin dependent diabetes mellitus (IDDM) and is characterized by hyperglycemia, severe dehydration and metabolic acidosis.

3. Why does an individual suffering from diabetes have polyuria?

Increased blood glucose levels promote diuresis which leads to dehydration.

4. . Based on your suspected diagnosis, what is occurring physiologically when an individual suffers from this condition?

Insulin dependent diabetes mellitus (IDDM) occurs when the beta cells of the pancreas fail to produce adequate amounts of insulin or cease to produce insulin altogether.

Insulin is a hormone produced in the pancreatic beta cells that facilitates and regulates the uptake of glucose from the bloodstream and into the cell, where it is utilized in the production of energy. In the absence of insulin, the cells will starve for glucose.

For the reviewer:

Teaching Notes: What is your impression of this case? Would you change or add/delete any information provided?

Do you feel that this case meets the objectives established?

Appendix G
Consent Forms

Greensboro College

Consent to Participate in Human Subjects Research

Project Title: The Effects of Problem-Based Learning on Students' Critical Thinking Skills

Project Director: Michelle M. Lesperance

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PURPOSE AND PROCEDURES:

The purpose of this study is to examine the effects of PBL on undergraduate students' critical thinking (CT) disposition scores as measured by the California Critical Thinking Disposition Inventory (CCTDI) and critical thinking skills as measured by the California Critical Thinking Skills Test (CCTST). The researcher will also examine whether there is a significant relationship between a student's disposition to critically think and their critical thinking scores.

Participants will be enrolled in ATH 1100 A or B Prevention and Care of Emergencies and Athletic Injuries or will be a control group of AT students. Students will be required (as part of the course requirements) to take an online examination to assess critical thinking disposition and skills three times during the semester. This testing will take place during the regularly scheduled class time.

POTENTIAL RISKS AND DISCOMFORTS:

There is no risks to participation

POTENTIAL BENEFITS: There is no direct benefit to participants. These results will be used to give a better understanding of the positive benefits of alternative methods of teaching as well as the relationship between CT disposition and skill.

CONSENT: By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse consent or to withdraw your consent to have your data included in this research at any time without penalty or prejudice; your participation is entirely voluntary. The principal investigator will not have access to information regarding who agreed to participate in the study until final grades are submitted. Your privacy will be protected because you will not be identified by name as a participant in this project. All data will be secured in the Project Director's office for a period of three years and will then be destroyed.

The Greensboro College Research and Professional Development Subcommittee has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Dr. Kathleen Keating at (336) 272-

7102 x308. Questions regarding the research itself will be answered by Michelle Lesperance by calling 336-272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are affirming that you are 18 years of age or older and are agreeing to participate in the project described to you by Dr. Robert Charles-Liscombe.

Participant's Signature*

Date

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The effects of problem-based learning on students' critical thinking skills

Project Director: Michelle Lesperance, MS, ATC, LAT

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

We invite you to participate in a study that will investigate the effect of different teaching methods on critical thinking disposition and skill. There will be no additional items for you to complete if you decide to participate in the study. All the data that will be collected in the current study is part of your class assignments for ATH 1100 or ATH 2310, 3310 or 4310. By agreeing to participate in this study, you are allowing us to include your scores on the California Critical Thinking Disposition Index (CCTDI), California Critical Thinking Skills test (CCTST), and your exam scores in the study. You will complete the CCTDI and CCTST at the beginning, middle and end of the semester during class time. The total time required to complete the CCTDI is approximately 20 minutes and the CCTST is a 45 minute timed test. In addition, for students enrolled in ATH 1100 we will be collecting your current GPA and the grades that you attained on exams in the class. None of this information will be looked at until after you have completed ATH 1100, ATH 2310, 3310 or 4310 and your final grade has been submitted. The instructor will not know who has agreed to participate in the study. An additional group of students will participate voluntarily as a control group of Kinesiology students.

RISKS AND DISCOMFORTS:

There are no risks associated with participation in this study. The instructors will have no knowledge about whether or not you agree to participate in the study and none of the data will be analyzed until after final grades have been submitted for the class.

POTENTIAL BENEFITS:

There are no direct benefits to you for participating in this study. However, data from this study may be used to improve the instructional methods used in athletic training for future classes and will also provide information on changes in the critical thinking skills of students enrolled in athletic training courses.

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. The Research and Professional Development Subcommittee at Greensboro College has also approved this research and this consent form. Questions regarding

the research itself will be answered by Michelle Lesperance by calling 272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are indicating that you are 18 years of age or older and are agreeing to participate in the project described to you by Robert Charles-Liscombe, EdD.

Participant's Signature*

Date

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The effects of problem-based learning on students' critical thinking skills

Project Director: Michelle Lesperance, MS, ATC, LAT

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

We invite you to participate in a study that will investigate the effect of different teaching methods on critical thinking disposition and skill. There will be no additional items for you to complete if you decide to participate in the study. All the data that will be collected in the current study is part of your class assignments for ATH 1100 or ATH 2310, 3310 or 4310. By agreeing to participate in this study, you are allowing us to include your scores on the California Critical Thinking Disposition Index (CCTDI), California Critical Thinking Skills test (CCTST), and your exam scores in the study. You will complete the CCTDI and CCTST at the beginning, middle and end of the semester during class time. The total time required to complete the CCTDI is approximately 20 minutes and the CCTST is a 45 minute timed test. In addition, for students enrolled in ATH 1100 we will be collecting your current GPA and the grades that you attained on exams in the class. None of this information will be looked at until after you have completed ATH 1100, ATH 2310, 3310 or 4310 and your final grade has been submitted. The instructor will not know who has agreed to participate in the study. An additional group of students will participate voluntarily as a control group of Kinesiology students.

RISKS AND DISCOMFORTS:

There are no risks associated with participation in this study. The instructors will have no knowledge about whether or not you agree to participate in the study and none of the data will be analyzed until after final grades have been submitted for the class.

POTENTIAL BENEFITS:

There are no direct benefits to you for participating in this study. However, data from this study may be used to improve the instructional methods used in athletic training for future classes and will also provide information on changes in the critical thinking skills of students enrolled in athletic training courses.

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. The Research and Professional Development Subcommittee at Greensboro College has also approved this research and this consent form. Questions regarding

the research itself will be answered by Michelle Lesperance by calling 272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are indicating that you are 18 years of age or older and are agreeing to participate in the project described to you by Robert Charles-Liscombe, EdD.

Participant's Signature*

Date

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The effects of problem-based learning on students' critical thinking skills

Project Director: Michelle Lesperance, MS, ATC, LAT

Participant's Name: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

We invite you to participate in a study that will investigate the effect of different teaching methods on critical thinking disposition and skill. There will be no additional items for you to complete if you decide to participate in the study. All the data that will be collected in the current study is part of your class assignments for ATH 1100 or ATH 2310, 3310 or 4310. By agreeing to participate in this study, you are allowing us to include your scores on the California Critical Thinking Disposition Index (CCTDI), California Critical Thinking Skills test (CCTST), and your exam scores in the study. You will complete the CCTDI and CCTST at the beginning, middle and end of the semester during class time. The total time required to complete the CCTDI is approximately 20 minutes and the CCTST is a 45 minute timed test. In addition, for students enrolled in ATH 1100 we will be collecting your current GPA and the grades that you attained on exams in the class. Students enrolled in ATH 1100A will complete a self assessment evaluation at the end of the semester. For students enrolled in ATH 1100B, at the end of the semester, you will also be asked to reflect on the cohesiveness of your group as well as your own perceptions of the process of PBL.. None of this information will be looked at until after you have completed ATH 1100, ATH 2310, 3310 or 4310 and your final grade has been submitted, therefore this information will not impact your grade in any way. The instructor will not know who has agreed to participate in the study. An additional group of students will participate voluntarily as a control group of Kinesiology students.

RISKS AND DISCOMFORTS:

There are no risks associated with participation in this study. The instructors will have no knowledge about whether or not you agree to participate in the study and none of the data will be analyzed until after final grades have been submitted for the class.

POTENTIAL BENEFITS:

There are no direct benefits to you for participating in this study. However, data from this study may be used to improve the instructional methods used in athletic training for future classes and will also provide information on changes in the critical thinking skills of students enrolled in athletic training courses.

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. The Research and Professional Development Subcommittee at Greensboro College has also approved this research and this consent form. Questions regarding the research itself will be answered by Michelle Lesperance by calling 272-7102 x629. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are indicating that you are 18 years of age or older and are agreeing to participate in the project described to you by Robert Charles-Liscombe, EdD.

Participant's Signature*

Date

Appendix H
ATH 1100A Prevention and Care of Emergencies
and Athletic Injuries Syllabus

***SYLLABUS: ATH 1100A Prevention and Care of
Emergencies and Athletic Injuries
SPRING 2008***

Course Day/Time: MWF 9:45-10:45

Credit Hours: 4

Instructor: Michelle Lesperance, ATC, LAT

Email: mlesperance@gborocollege.edu

Office and phone #: PHW 110 272-7102 X 629

Office Hours: Mondays 3:30-4:30, Tuesdays 3:30-4:30, Wednesdays 1:30-3:00.

Others by appointment.

Textbooks:

(Required)

Prentice, W *Athletic Training: An Introduction to Professional Practice*. Boston: McGraw Hill; 2006

Thygerson, A *First Aid, CPR and AED, 5th edition*. Boston: Jones and Bartlett; 2007

Gulli, B *Professional Rescuer CPR, 3rd edition*. Boston: Jones and Bartlett; 2007

Other Materials that are required: resuscitation pocket mask (available in the bookstore),

Course Objectives:

1. The student will demonstrate proficiency in Athletic Training Educational Competencies.
2. The student will demonstrate an understanding of the history and development of the profession of Athletic Training and the role of the ATC.
3. The student will access and explain current NATA position statements.
4. Students will become familiar with the requirements of attaining and retaining BOC certification as an athletic trainer.
5. The student will understand the roles of medical and other allied health personnel and how ATC's work with them to provide optimal health care.
6. The student will understand the legal issues associated with athletic training.
7. The student will identify and explain the epidemiology data related to the risk of injury and illness and will be able to explain the risk factors associated with physical activity.
8. The student will learn and demonstrate an understanding of the administrative aspects of athletic training.
9. The student will learn and understand the importance of documentation in athletic training.
10. The student will learn and understand the risk management issues associated with athletic training and will be able to develop an emergency action plan.
11. Student will demonstrate an understanding of a variety of environmental conditions.
12. Student will become knowledgeable with and will be able to demonstrate basic life support skills including CPR for the professional rescuer.
13. The student will understand and demonstrate first aid skills.

14. The student will become familiar with guidelines related to protective equipment and will be able to demonstrate fitting of particular protective equipment.
15. The student will be able to describe and identify common signs and symptoms of injuries to the head and face and the following systems: respiratory, cardiovascular, gastrointestinal, hepatic-biliary, neurological, skin, and others as listed in the NATA Educational Competencies.
16. The student will become familiar with OSHA guidelines, signs and symptoms of serious communicable diseases and describe how to prevent disease transmission.
17. The student will understand the components of a patient assessment.

LABS/LAB PRACTICAL – 200 points

There are first aid and emergency skills that you must perform during the semester to pass this course. Failure to do so will result in an “F” in the course. There will be one lab practical given at the end of the semester. To receive CPR/PR certification, you must pass both the lab practical AND Exam #2 with an 80% or higher. To receive first aid certification, you must pass both the lab practical AND the course with an 80% or higher.

ASSIGNMENTS – 400 points

Throughout the semester, you will be given a variety of assignments. These may include quizzes on the required reading, individual assignments, group collaboration assignments, written assignments, etc. These assignments will be worth 400 points of your final grade. If you miss a class, it is your responsibility to find out what you missed. Late assignments will be accepted, however, for each day that the assignment is late, you will lose 10% of the grade. Assignments will only be accepted for 5 days after the assigned deadline, no exceptions.

TESTS– 300 points

Tests (3) will be given throughout the semester (each one worth 100 pts.). DO NOT wait until the night before to study for the test, because your brain cannot absorb that much information and retain it all in one night. You will perform much better in this course if you keep up with the readings and the course information. I expect you to be prepared for class, be ready to discuss information and perform to the best to your ability in this course. Your purpose is to learn, my purpose is to help you learn. **Make up exams will NOT be allowed unless you notify me at least one hour prior to class AND have a valid excuse for missing class (i.e. a medical condition). The instructor has the discretion to accept or reject any request for making up exams.**

CCTDI and CCTST – (P/F)

As a requirement of the course, you will be required to complete a critical thinking disposition inventory (CCTDI) and critical thinking skills test (CCTST) on-line three times during the semester. This will occur during class time. Participation is required and you must complete each test to pass the course. You may choose not to have your scores included in a research study and if you do so, it will not affect your grade in any way.

Online Course Software and Communication:

Each student will be required to enroll in the online course platform, **www.moodle.gborocollege.edu** , hosted on the school’s server. Students will be required to post a student profile with a current e-mail address and check the course site on a regular basis (every other day recommended). I will use the course platform to distribute class notes, outside reading assignments and resources, and other assignments or announcements.

Attendance

Attendance is required at all class and laboratory sessions. You are allowed 3 absences and this includes oversleeping. If you miss more than 3 classes with unexcused absences, you may be dropped from the course. If you miss a LAB, you will be required to make up the lab **before** the next LAB session. It is not the instructor's responsibility to make up the lab. I highly recommend that you attend class on a regular basis if you want to be successful in this class.

Tardiness

Please make every effort to arrive to class on time. I understand that there are circumstances that arise that may cause you to be late to class, but do not make it a habit. You miss valuable information when you arrive late to class, not to mention that it is disruptive to the rest of the class. If attendance is taken before you arrive, you will be counted absent.

Cell Phone Usage

Use of cell phones are not permitted in class except in emergencies. Please be respectful of the instructor and other students and turn your cell phone to off or vibrate during class.

Disability/Medical Restrictions

Students with medical concerns in relation to physical activity must discuss this with the instructor **prior to the third class period**. Documentation of other disabilities or special accommodations should be brought to the instructor within the first week of school.

Academic Honor Code

I expect that you will possess a high level of academic integrity.

- 1) All academic endeavors at Greensboro College are based on the expectation and assumption that each student will uphold the highest principles of honesty and fairness. This expectation and assumption finds expression in the Academic Honor Code, which every student is committed to uphold.

*Please refer to:

<http://www.gborocollege.edu/academics/07catalog/acadpol/general/honorcode.html>

Course Assessment***Lecture grade***

TEST #1	100 pts.	_____
TEST #2	100 pts.	_____
TEST #3	100 pts.	_____
Lab Practical	200 pts.	_____
ASSIGNMENTS	400 points	_____
LABS	Pass/Fail	_____
CCTDI/CCTST	Pass/Fail	_____

TOTAL _____/900 pts.

Point Structure:**A = 94 -100%****A- = 90 – 93%****B+ = 87% - 89%****B = 83 -86%****B - = 80 – 82 %****C+ = 77% - 79%****C = 73 -76%****C - = 70 – 72 %****D+ = 67% - 69%****D = 60 - 66%****F= Below 60%**

ATH 1100A SPRING 2008
COURSE OUTLINE**

***This outline is subject to change*

Date	Topic	Reference	Course Objectives
WEEK #1 Wed. Jan.16 ^h	Introduction, The Athletic Trainer and Sports Medicine Team	Chap. 1 Prentice	PD-C6 Summarize the position statements regarding the practice of athletic training PD-C16 Summarize the history and development of the athletic training profession. AD-C20 Differentiate the roles and responsibilities of the athletic trainer from those of other medical and allied health personnel who provide care to patients involved in physical activity and describe the necessary communication skills for effectively interacting with these professionals. AD-C21 Describe role and functions of various community-based medical, paramedical, and other health care providers and protocols that govern the referral of patients to these professionals.
Fri. Jan.18 th	The Athletic Trainer and Sports Medicine Team	Chap 1 Prentice	PD-C2 Describe the process of attaining and maintaining national and state athletic training professional credentials. PD-C8 Summarize the current requirements for the professional preparation of the athletic trainer.
WEEK #2 Mon. Jan.21st	MARTIN LUTHER KING JR. DAY NO CLASSES		
Wed. Jan.23rd	Health Care Administration CCTDI /Bloodborne Pathogens Training	Chap. 2 Prentice Online Assignment for Bloodborne Pathogens	AC-C28 Identify the signs and symptoms of serious communicable diseases and describe the appropriate steps to prevent disease transmission.

			<p>AD-C7 Describe federal and state infection control regulations and guidelines, including universal precautions as mandated by the Occupational Safety and Health Administration (OSHA), for the prevention, exposure, and control of infectious diseases and discuss how they apply to the athletic trainer.</p> <p>RM-C4 Identify and explain the recommended or required components of a preparticipation examination based on appropriate authorities' rules, guidelines, and/or recommendations</p> <p>RM-C5 Describe the basic concepts and practice of a wellness screening</p> <p>AD-C1 Describe organization and administration of preparticipation physical examinations and screening including, but not limited to, developing assessment and record-keeping forms that include the minimum recommendations from recognized health and medical organizations, scheduling of appropriate health and medical personnel, and efficient site use.</p>
Fri. Jan.25 th	CCTST	Meet in PHW Computer Lab	
WEEK #3 Mon. Jan.28 th	Health Care Administration , cont.	Chap. 2 Prentice	<p>AD-C2 Identify components of a medical record (e.g., emergency information, treatment documentation, epidemiology, release of medical information, etc.), common medical record-keeping techniques and strategies, and strengths</p>

			and weaknesses of each approach and the associated implications of privacy statutes (Health Insurance Portability and Accountability Act [HIPAA] and Federal Educational Rights Privacy Act [FERPA]). AD-C15 Explain typical administrative policies and procedures that govern first aid and emergency care (e.g., informed consent and incident reports).
Wed. Jan. 30 th	Legal Concerns and Insurance Issues	Chap. 3 Prentice	RM-C1 Explain the risk factors associated with physical activity. RM-C3 Identify and explain the epidemiology data related to the risk of injury and illness related to participation in physical activity AD-C10 Describe the various types of health insurance models (e.g., health maintenance organization [HMO], preferred provider organization [PPO], fee-for-service, cash, and Medicare) and the common benefits and exclusions identified within these models. AD-C17 Explain basic legal concepts as they apply to a medical or allied health care practitioner's responsibilities (e.g., standard of care, scope of practice, liability, negligence, informed consent and confidentiality, and others).
Fri. Feb. 1st	TEST #1 Chap. 1-3		
WEEK #4 Mon. Feb. 4 th	Environmental Considerations: Collaborative Learning Assignment	Chap. 6 Prentice NATA Position Statements Chap. 20-21 AAOS	RM-C8 Explain the principles of effective heat loss and heat illness prevention programs.

			<p>Principles include, but are not limited to, knowledge of the body's thermoregulatory mechanisms, acclimation and conditioning, fluid and electrolyte replacement requirements, proper practice and competition attire and weight loss.</p> <p>RM-C9 Explain the accepted guidelines, recommendations, and policy and position statements of applicable governing agencies related to activity during extreme weather conditions.</p> <p>RM-C20 Recognize the clinical signs and symptoms of environmental stress</p> <p>DI-C14 Describe the clinical signs and symptoms of environmental stress</p> <p>AC-C29 Identify the signs, symptoms and treatment of patients suffering from adverse reactions to environmental conditions</p>
Wed. Feb. 6 th	Environmental Considerations	Chap. 6 Prentice	<p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <ul style="list-style-type: none"> g. Normalize body temperature in situations of severe/life-threatening heat or cold stress <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <ul style="list-style-type: none"> c. Environmental illness
Fri. Feb. 8 th	Protective Equipment	Chap. 7 Prentice	<p>RM-16 Explain the basic principles associated with the use of protective</p>

			equipment, including standards for design, construction, fit, maintenance, and reconditioning of protective equipment; and rules and regulations established by the associations that govern the use of protective equipment; and material composition
WEEK #5 Mon. Feb. 11 th	Intro to Emergency Care	Chap. 11 Prentice	<p>AC-C9 Describe the current standards of first aid, emergency care, rescue breathing, and cardiopulmonary resuscitation for the professional rescuer.</p> <p>AC-C1 Explain the legal, moral, and ethical parameters that define the scope of first aid and emergency care and identify the proper roles and responsibilities of the certified athletic trainer.</p> <p>AC-C5 Describe the principles and rationale of the initial assessment including the determination of whether the accident scene is safe, what may have happened, and the assessment of airway, breathing, circulation, level of consciousness and other life-threatening conditions.</p> <p>AC-C6 Differentiate the components of a secondary assessment to determine the type and severity of the injury or illness sustained.</p> <p>AC-C7 Identify the normal ranges for vital signs</p> <p>AC-C8 Describe pathological signs of acute/traumatic injury and illness including, but not limited to, skin temperature, skin color, skin moisture, pupil reaction, and neurovascular</p>

			function.
Wed. Feb. 13 th	On the Field Acute Care and Emergency Procedures: Emergency Action Plans	Chap. 10 Prentice NATA Position Statement Chap. 1-2 AAOS, Chap 1 in AAOS CPR/PR	AC-C2 Describe the availability, content, purpose, and maintenance of contemporary first aid and emergency care equipment. AC-C3 Determine what emergency care supplies and equipment are necessary for circumstances in which the athletic trainer is the responsible first responder. AC-C4 Know and be able to use appropriately standard nomenclature of injuries and illnesses AD-P2 Develop risk management plans, including facility design, for safe and efficient health care facilities.
Fri. Feb. 15 th	On the Field Acute Care and Emergency Procedures: Emergency Action Plans	Chap. 10 Prentice PRESENTATIONS	AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: a. Activate an emergency action plan AD-C16 Identify and describe basic components of a comprehensive emergency plan for the care of acutely injured or ill patients, which include (1) emergency action plans for each setting or venue; (2) personnel education and rehearsal; (2) emergency care supplies and equipment appropriate for each venue; (3) availability of emergency care facilities; (4) communication with onsite personnel and notification of EMS; (5) the availability, capabilities, and policies of community- based emergency care

			<p>facilities and community-based managed care systems; (6) transportation; (7) location of exit and evacuation routes; (8) activity or event coverage; and (9) record keeping.</p> <p>AD-C18 Identify components of a comprehensive risk management plan that addresses the issues of security, fire, electrical and equipment safety, emergency preparedness, and hazardous chemicals.</p>
<p>WEEK #6 Mon. Feb. 18th</p>	<p>On the Field Acute Care and Emergency Procedures: Patient Assessment</p>	<p>Chap. 3-4 AAOS, Chap 3 AAOS CPR/PR</p>	<p>DI-C4 Explain directional terms and cardinal planes used to describe the body and the relationship of its parts</p> <p>DI-C6 Describe common techniques and procedures for evaluating common injuries including taking a history, inspection/observation, palpation, functional testing, special evaluation techniques, and neurological and circulatory tests</p> <p>DI-C10 Explain the roles of special tests in injury assessment</p> <p>DI-C16 Explain medical terminology and abbreviations necessary to communicate with physicians and other health professionals.</p> <p>DI-C17 Describe the components of medical documentation (e.g. SOAP, HIPS and HOPS)</p> <p>AC-C30 Identify information obtained during the examination to determine when to refer an injury or illness for further or immediate medical attention.</p> <p>AC- P1 Survey the scene</p>

			<p>to determine whether the area is safe and determine what may have happened.</p> <p>AC-P2 Perform an initial assessment to assess the following, but not limited to:</p> <ul style="list-style-type: none"> a. Airway b. Breathing c. Circulation d. Level of consciousness e. Other life threatening conditions
Wed. Feb. 20 th	On the Field Acute Care and Emergency Procedures: Patient Assessment LAB		<p>DI-P2 Perform inspection/observation of the clinical signs associated with common injuries including deformity, posturing and guarding, edema/swelling, hemarthrosis, and discoloration</p> <p>MC-P2 Perform a visual observation of the clinical signs associated with common injuries and/or illnesses including deformity, edema/swelling, discoloration, and skin abnormalities.</p> <p>MCP4c Pupil response, size and shape, and ocular motor function</p>
Fri. Feb. 22 nd	Respiratory Conditions and Emergencies	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR	<p>MC-C7 Describe and know when to refer common and significant respiratory infections, thoracic trauma, and lung disorders. (e.g., influenza, pneumonia, bronchitis, rhinitis, sinusitis, upper-respiratory infection (URI), pneumothorax, hemothorax, pneumomediastinum, exercise-induced bronchospasm, exercise-induced anaphylaxis, asthma).</p> <p>MC-C9 Describe the strategies for reducing the</p>

			frequency and severity of asthma attacks.
WEEK #7 Mon. Feb. 25 th	Respiratory Conditions and Emergencies LAB	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR	AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: b. Establish and maintain an airway in an infant, child, and adult c. Establish and maintain an airway in a patient wearing shoulder pads, headgear or other protective equipment AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: e. Acute asthma attack
Wed. Feb. 27 th	Respiratory Conditions, cont. CCTDI		
Fri. Feb. 29 th	CCTST	Meet in PHW computer lab	
WEEK #8 Mon. March 3rd - Fri. March 7th	SPRING BREAK		
WEEK #9 Mon. March 10 th	Oxygen Administration	Chap. 6 AAOS CPR/PR	AC-C11 Describe the role and function of supplemental oxygen administration as an adjunct to cardiopulmonary resuscitation techniques.
Wed. March 12 th	Cardiovascular Conditions	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR	MC-C10 Explain the possible causes of sudden death syndrome. MC-C11 Describe and know when to refer common cardiovascular and hematological medical conditions from trauma, deformity, acquired disease, conduction disorder, and drug abuse (e.g., coronary artery disease, hypertrophic cardiomyopathy, heart murmur, mitral valve

			prolapse, commotion cordis, Marfan's syndrome, peripheral embolism, hypertension, arrhythmogenic right ventricular dysplasia, Wolf-Parkinson-White syndrome, anemias, sickle cell anemia and sickle cell trait [including rhabdomyolysis], hemophilia, deep vein thrombosis, migraine headache, syncope).
Fri. March 14 th	Cardiovascular Conditions/Use of an AED	Chap. 6 AAOS, Chap. 4-5 AAOS CPR/PR	RM-C7 Explain the importance for all personnel to maintain current certification in CPR, automated external defibrillator (AED) and first aid. AC-C10 Describe the role and function of an automated external defibrillator in the emergency management of acute heart failure and abnormal heart rhythms.
WEEK #10 Mon. March 17 th	Cardiac Emergencies LAB		AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: d. Perform one- and two-person CPR on an infant, child, and adult and/or with a suspected spine injury e. Utilize a bag-valve mask on an infant, child, and adult f. Utilize an automated external defibrillator (AED) according to current accepted practice protocols
Wed. March 19 th	TEST #2 Patient Assessment, Respiratory and Cardiovascular Conditions Test		

Fri. March 21st	GOOD FRIDAY, No Classes		
WEEK #11 Mon. March 24 th	Bleeding and Shock	Chap. 7-9 AAOS	AC-C13 Describe the proper management of external hemorrhage, including the location of pressure points, use of universal precautions, and proper disposal of biohazardous materials. AC-C14 Identify the signs and symptoms associated with internal hemorrhaging.
Wed. March 26th	ASSESSMENT DAY: NO CLASSES		
Fri. March 28 th	Bleeding and Shock	Chap. 7-9 AAOS	AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following: a. Different types of shock AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: f. Different types of shock
WEEK #12 Mon. March 31 st	Skin Conditions Poisoning/Bites and Stings LAB: Anaphylactic Shock	Chap. 18-19 AAOS	MC-C15 Describe and know when to refer common and/or contagious skin lesions from trauma, infection, stress, drug reaction, and immune responses (e.g., wounds, bacteria lesions, fungal lesions, viral lesions, bites, acne, eczema dermatitis, ringworm). AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following: e. Allergic, thermal, and chemical reactions of the skin (including infestations and insect bites)

			<p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <ul style="list-style-type: none"> i. Administer an EpiPen for anaphylactic shock <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <ul style="list-style-type: none"> 1. Allergic, thermal, and chemical reactions of the skin (including infestations and insect bites) <p>PH-C9 Identify medications that might cause possible poisoning, and describe how to activate and follow the locally established poison control protocols.</p> <p>PH-P3 Activate and effectively follow locally established poison control protocols.</p>
Wed. April 2 nd	Soft Tissue Injuries	Chap. 9, Chap. 11 AAOS	<p>AC-C16 Describe the injuries and illnesses that require medical referral</p> <p>AC-C17 Explain the application principles of rest, cold application, elevation, and compression in the treatment of acute injuries</p> <p>AC-C18 Describe the signs, symptoms, and pathology of acute inflammation.</p> <p>AC-C33 Describe home care and self-treatment plans of acute injuries and illnesses.</p>
Fri. April 4 th	Musculoskeletal Injuries	Chap. 14 AAOS	
WEEK #13 Mon. April 7 th	Injuries to the Extremities	Chap. 15 AAOS	AC-P4 Perform a secondary assessment and

			<p>employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p>h. Acute musculoskeletal injuries (i.e. sprains, strains, fractures, dislocations)</p>
Wed. April 9 th	WOUND CARE/SPLINTING LAB	Chap. 10, 16 AAOS	<p>AC-C15 Describe the appropriate use of aseptic or sterile techniques, approved sanitation methods, and universal precautions for the cleansing and dressing of wounds.</p> <p>AC-C31 Describe the proper immobilization techniques and select appropriate splinting material to stabilize the injured joint or limb and maintain distal circulation.</p> <p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <p>h. Control bleeding using universal precautions</p> <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p>a. Open and closed wounds (using universal precautions)</p>
Fri. April 11 th	Injuries to the Head, Neck and Back	Chap. 12 AAOS	<p>AC-C19 Identify the signs and symptoms of head trauma, including loss of consciousness, changes in standardized neurological function, cranial nerve assessment, and other symptoms that indicate underlying trauma.</p> <p>AC-C20 Explain the importance of monitoring a</p>

		<p>patient following a head injury, including obtaining clearance from a physician before further patient participation.</p> <p>AC-C21 Define cerebral concussion, list the signs and symptoms of concussions, identify the methods for determining the neurocognitive status of a patient who sustains a concussion and describe contemporary concepts for the management and return-to-participation of a patient who sustains a concussion.</p> <p>AC-C22 Identify the signs and symptoms of trauma to the cervical, thoracic and lumbar spines, the spinal cord, and spinal nerve roots, including neurological signs, referred symptoms, and other symptoms that indicate underlying trauma and pathology.</p> <p>AC-C23 Describe cervical stabilization devices that are appropriate to the circumstances of an injury.</p> <p>AC-C24 Describe the indications, guidelines, proper techniques and necessary supplies for removing equipment and clothing in order to evaluate and/or stabilize the involved area.</p> <p>AC-C25 Describe the effective management, positioning, and immobilization of a patient with a suspected spinal cord injury.</p> <p>MC-C4 Describe and know when to refer common eye pathologies from trauma and/or localized infection (e.g., conjunctivitis, hyphema,</p>
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			<p>corneal injury, stye, scleral trauma).</p> <p>MC-C5 Describe and know when refer common ear pathologies from trauma and/or localized infection (e.g., otitis, ruptured tympanic membrane, impacted cerumen).</p> <p>MC-C6 Describe and know when to refer common pathologies of the mouth, sinus, oropharynx, and nasopharynx from trauma and/or localized infection (e.g., gingivitis, sinusitis, laryngitis, tonsillitis, pharyngitis).</p> <p>MC-C17 Describe and know when to refer common neurological medical disorders from trauma, anoxia, drug toxicity, infection, and congenital malformation (e.g., concussion, postconcussion syndrome, second-impact syndrome, subdural and epidural hematoma, epilepsy, seizure, convulsion disorder, meningitis, spina bifida, cerebral palsy, chronic regional pain syndrome [CRPS], cerebral aneurysm).</p> <p>MC-C21 Describe and know when to refer common injuries or conditions of the teeth (e.g., fractures, dislocations, caries).</p>
WEEK #14 Mon. April 14 th	Injuries to the Head, Neck and Back	Chap. 12 AAOS	<p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p style="padding-left: 40px;">b. Closed-head trauma (using standard neurological tests and tests</p>

			for cranial nerve function) i. Spinal cord and peripheral nerve injuries
Wed. April 16 th	Injuries to the Chest, Abdomen and Pelvis	Chap. 13 AAOS	<p>AC-C12 Describe the characteristics of common life-threatening conditions that can occur either spontaneously or as the result of direct trauma to the throat, thorax and viscera, and identify the management of these conditions.</p> <p>MC-C12 Describe and know when to refer common medical conditions that affect the gastrointestinal and hepatic-biliary systems from trauma, chemical and drug irritation, local and systemic infections, psychological stress, and anatomic defects (e.g., hepatitis, pancreatitis, dyspepsia, gastroesophageal reflux, peptic ulcer, gastritis and gastroenteritis, inflammatory bowel disease, irritable bowel syndrome, appendicitis, sports hernia, hemorrhoids, splenomegaly, liver trauma).</p> <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <ul style="list-style-type: none"> g. Thoracic, respiratory, and internal abdominal injury or illness
Fri. April 18 th	Sudden Illness	Chap. 17 AAOS	<p>AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following:</p> <ul style="list-style-type: none"> b. Diabetic coma c. Seizures d. Toxic drug overdoses

WEEK #15 Mon. April 21 st	Sudden Illness	Chap. 17 AAOS	AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: d. Seizures j. Diabetic coma k. Toxic drug overdose
Wed. April 23 rd	Sudden Illness	Chap. 17 AAOS	
Fri. April 25 th	Reaching and Moving Victims CCTDI	Chap. 25 AAOS, Chap. 7 AAOS CPR/PR	AC-C26 Identify the appropriate short-distance transportation method, including immobilization, for an injured patient. AC-C32 Describe the proper ambulatory aid and technique for the injury and patient.
WEEK #16 Mon. April 28 th	CCTST	Meet in PHW 206 Computer Lab	
Friday, May 2 9:30-12:30 pm	DURING FINAL EXAM WEEK: TEST #3		
FINAL LAB PRACTICALS	DURING FINAL EXAM WEEK: <i>SIGN UP FOR TIME IN CLASS</i>	Wed. April 30-Tues. May 6th	

Appendix I
ATH 1100B Prevention and Care of Emergencies
and Athletic Injuries Syllabus

***SYLLABUS: ATH 1100B Prevention and Care of
Emergencies and Athletic Injuries
SPRING 2008***

Course Day/Time: MWF 12:15 to 1:15 pm

Credit Hours: 4

Instructor: Michelle Lesperance, ATC, LAT

Email: mlesperance@gborocollege.edu

Office and phone #: PHW 110 272-7102 X 629

Office Hours: Mondays 3:30-4:30, Tuesdays 3:30-4:30, Wednesdays 1:30-3:00.

Others by appointment.

Textbooks:

(Required)

Prentice, W *Athletic Training: An Introduction to Professional Practice*. Boston: McGraw Hill; 2006

Thygerson, A *First Aid, CPR and AED, 5th edition*. Boston: Jones and Bartlett; 2007

Gulli, B *Professional Rescuer CPR, 3rd edition*. Boston: Jones and Bartlett; 2007

Other Materials that are required: resuscitation pocket mask (available in the bookstore),

Course Objectives:

1. The student will demonstrate proficiency in Athletic Training Educational Competencies.
2. The student will demonstrate an understanding of the history and development of the profession of Athletic Training and the role of the ATC.
3. The student will access and explain current NATA position statements.
4. Students will become familiar with the requirements of attaining and retaining BOC certification as an athletic trainer.
5. The student will understand the roles of medical and other allied health personnel and how ATC's work with them to provide optimal health care.
6. The student will understand the legal issues associated with athletic training.
7. The student will identify and explain the epidemiology data related to the risk of injury and illness and will be able to explain the risk factors associated with physical activity.
8. The student will learn and demonstrate an understanding of the administrative aspects of athletic training.
9. The student will learn and understand the importance of documentation in athletic training.
10. The student will learn and understand the risk management issues associated with athletic training and will be able to develop an emergency action plan.
11. Student will demonstrate an understanding of a variety of environmental conditions.
12. Student will become knowledgeable with and will be able to demonstrate basic life support skills including CPR for the professional rescuer.
13. The student will understand and demonstrate first aid skills.

14. The student will become familiar with guidelines related to protective equipment and will be able to demonstrate fitting of particular protective equipment.
15. The student will be able to describe and identify common signs and symptoms of injuries to the head and face and the following systems: respiratory, cardiovascular, gastrointestinal, hepatic-biliary, neurological, skin, and others as listed in the NATA Educational Competencies.
16. The student will become familiar with OSHA guidelines, signs and symptoms of serious communicable diseases and describe how to prevent disease transmission.
17. The student will understand the components of a patient assessment.

LABS/LAB PRACTICAL – 200 points

There are first aid and emergency skills that you must perform during the semester to pass this course. Failure to do so will result in an “F” in the course. There will be one lab practical given at the end of the semester. To receive CPR/PR certification, you must pass both the lab practical AND Exam #2 with an 80% or higher. To receive first aid certification, you must pass both the lab practical AND the course with an 80% or higher.

ASSIGNMENTS – 200 points

Throughout the semester, you will be given a variety of assignments. These may include quizzes on the required reading, individual assignments, group collaboration assignments, written assignments, etc. These assignments will be worth 200 points of your final grade. If you miss a class, it is your responsibility to find out what you missed. Late assignments will be accepted, however, for each day that the assignment is late, you will lose 10% of the grade. Assignments will only be accepted for 5 days after the assigned deadline, no exceptions.

CCTDI and CCTST – (P/F)

As a requirement of the course, you will be required to complete a critical thinking disposition inventory (CCTDI) and critical thinking skills test (CCTST) on-line three times during the semester. This will occur during class time. Participation is required and you must complete each test to pass the course. You may choose not to have your scores included in a research study and if you do so, it will not affect your grade in any way. If you are not in class on the day that the test is administered, you **MUST** contact me to take it before the next scheduled class session.

PBL CASES – 440 points

Problem Based Learning is a method of teaching that fosters critical thinking by challenging students to work cooperatively in groups and seek solutions to real world problems. There will be four problem based learning cases assigned in the second half of the semester. Each case will take approximately four class sessions. Specific directions to cases will be handed out in class.

TESTS– 300 points

Tests (3) will be given throughout the semester (each one worth 100 pts.). **DO NOT** wait until the night before to study for the test, because your brain cannot absorb that much information and retain it all in one night. You will perform much better in this course if you keep up with the readings and the course information. I expect you to be prepared for class, be ready to discuss information and perform to the best of your ability in this course. Your purpose is to learn, my purpose is to help you learn. **Make up exams will NOT be allowed unless you notify me at least one hour prior to class AND have a valid excuse for missing class (i.e. a medical condition). The instructor has the discretion to accept or reject any request for making up exams.**

Online Course Software and Communication:

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Attendance

Attendance is required at all class and laboratory sessions. If you miss more than 3 classes with unexcused absences, you may be dropped from the course. If you miss a LAB, you will be required to make up the lab **before** the next LAB session. It is not the instructor's responsibility to make up the lab. Because of the teaching methods used in this course, I highly recommend that you attend class on a regular basis if you want to be successful in this class.

Tardiness

Please make every effort to arrive to class on time. I understand that there are circumstances that arise that may cause you to be late to class, but please do not make it a habit. You miss valuable information when you arrive late to class, not to mention that it is disruptive to the rest of the class. If attendance is taken before you arrive, you will be counted absent.

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Use of cell phones are not permitted in class except in emergencies. Please be respectful of the instructor and other students and turn your cell phone to off or vibrate during class.

Disability/Medical Restrictions

Students with medical concerns in relation to physical activity must discuss this with the instructor **prior to the third class period**. Documentation of other disabilities or special accommodations should be brought to the instructor within the first week of school.

Academic Honor Code

I expect that you will possess a high level of academic integrity.

- 2) All academic endeavors at Greensboro College are based on the expectation and assumption that each student will uphold the highest principles of honesty and fairness. This expectation and assumption finds expression in the Academic Honor Code, which every student is committed to uphold.

*Please refer to:

<http://www.gborocollege.edu/academics/07catalog/acadpol/general/honorcode.html>

Course Assessment***Lecture grade***

TEST #1	100 pts.	_____
TEST #2	100 pts.	_____
TEST #3	100 pts.	_____
Lab Practical	200 pts.	_____
ASSIGNMENTS	200 points	_____
PBL Cases	440 points	_____
LABS	Pass/Fail	_____
CCTDI/CCTST	Pass/Fail	_____

TOTAL _____ ***/1140 pts.***

Point Structure:**A = 94 -100%****A- = 90 – 93%****B+ = 87% - 89%****B = 83 -86%****B - = 80 – 82 %****C+ = 77% - 79%****C = 73 -76%****C - = 70 – 72 %****D+ = 67% - 69%****D = 60 - 66%****F= Below 60%**

ATH 1100B SPRING 2008**COURSE OUTLINE*******This outline is subject to change*

Date	Topic	Reference	Course Objectives
WEEK #1 Wed. Jan.16 ^h	Introduction, The Athletic Trainer and Sports Medicine Team	Chap. 1 Prentice	PD-C6 Summarize the position statements regarding the practice of athletic training PD-C16 Summarize the history and development of the athletic training profession. AD-C20 Differentiate the roles and responsibilities of the athletic trainer from those of other medical and allied health personnel who provide care to patients involved in physical activity and describe the necessary communication skills for effectively interacting with these professionals. AD-C21 Describe role and functions of various community-based medical, paramedical, and other health care providers and protocols that govern the referral of patients to these professionals.
Fri. Jan.18 th	The Athletic Trainer and Sports Medicine Team	Chap 1 Prentice	PD-C2 Describe the process of attaining and maintaining national and state athletic training professional credentials. PD-C8 Summarize the current requirements for the professional preparation of the athletic trainer.
WEEK #2 Mon. Jan.21st	MARTIN LUTHER KING JR. DAY NO CLASSES		
Wed. Jan.23rd	Health Care Administration CCTDI /Bloodborne Pathogens Training	Chap. 2 Prentice Online Assignment for Bloodborne Pathogens	AC-C28 Identify the signs and symptoms of serious communicable diseases and describe the appropriate steps to prevent disease transmission. AD-C7 Describe federal and state infection control regulations and guidelines, including universal precautions as mandated by the Occupational Safety and Health Administration (OSHA), for the prevention, exposure, and control of infectious diseases and discuss how they apply to the athletic trainer. RM-C4 Identify and explain the recommended or required components of a preparticipation examination based on appropriate authorities' rules, guidelines, and/or recommendations

			<p>RM-C5 Describe the basic concepts and practice of a wellness screening</p> <p>AD-C1 Describe organization and administration of preparticipation physical examinations and screening including, but not limited to, developing assessment and record-keeping forms that include the minimum recommendations from recognized health and medical organizations, scheduling of appropriate health and medical personnel, and efficient site use.</p>
Fri. Jan.25 th	CCTST	Meet in PHW 206 Computer Lab	
WEEK #3 Mon. Jan.28 th	Health Care Administration , cont.	Chap. 2 Prentice	<p>AD-C2 Identify components of a medical record (e.g., emergency information, treatment documentation, epidemiology, release of medical information, etc.), common medical record-keeping techniques and strategies, and strengths and weaknesses of each approach and the associated implications of privacy statutes (Health Insurance Portability and Accountability Act [HIPAA] and Federal Educational Rights Privacy Act [FERPA]).</p> <p>AD-C15 Explain typical administrative policies and procedures that govern first aid and emergency care (e.g., informed consent and incident reports).</p>
Wed. Jan. 30 th	Legal Concerns and Insurance Issues	Chap. 3 Prentice	<p>RM-C1 Explain the risk factors associated with physical activity.</p> <p>RM-C3 Identify and explain the epidemiology data related to the risk of injury and illness related to participation in physical activity</p> <p>AD-C10 Describe the various types of health insurance models (e.g., health maintenance organization [HMO], preferred provider organization [PPO], fee-for-service, cash, and Medicare) and the common benefits and exclusions identified within these models.</p> <p>AD-C17 Explain basic legal concepts as they apply to a medical or allied health care practitioner's responsibilities (e.g., standard of care, scope of practice, liability, negligence, informed consent and confidentiality, and others).</p>
Fri. Feb. 1st	TEST #1 Chap. 1-3		

WEEK #4 Mon. Feb. 4 th	Environmental Considerations	Chap. 6 Prentice NATA Position Statements Chap. 20-21 AAOS	<p>RM-C8 Explain the principles of effective heat loss and heat illness prevention programs. Principles include, but are not limited to, knowledge of the body's thermoregulatory mechanisms, acclimation and conditioning, fluid and electrolyte replacement requirements, proper practice and competition attire and weight loss.</p> <p>RM-C9 Explain the accepted guidelines, recommendations, and policy and position statements of applicable governing agencies related to activity during extreme weather conditions.</p> <p>RM-C20 Recognize the clinical signs and symptoms of environmental stress</p> <p>DI-C14 Describe the clinical signs and symptoms of environmental stress</p> <p>AC-C29 Identify the signs, symptoms and treatment of patients suffering from adverse reactions to environmental conditions</p>
Wed. Feb. 6 th	Environmental Considerations	Chap. 6 Prentice	<p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <p style="padding-left: 40px;">g. Normalize body temperature in situations of severe/life-threatening heat or cold stress</p> <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p style="padding-left: 40px;">c. Environmental illness</p>
Fri. Feb. 8 th	Protective Equipment	Chap. 7 Prentice	<p>RM-16 Explain the basic principles associated with the use of protective equipment, including standards for design, construction, fit, maintenance, and reconditioning of protective equipment; and rules and regulations established by the associations that govern the use of protective equipment; and material composition</p>
WEEK #5 Mon. Feb. 11 th	Intro to Emergency Care	Chap. 11 Prentice	<p>AC-C9 Describe the current standards of first aid, emergency care, rescue breathing, and cardiopulmonary resuscitation for the professional rescuer.</p> <p>AC-C1 Explain the legal, moral, and ethical parameters that define the scope of first aid and emergency care and identify the proper roles and responsibilities of the certified athletic trainer.</p> <p>AC-C5 Describe the principles and</p>

			<p>rationale of the initial assessment including the determination of whether the accident scene is safe, what may have happened, and the assessment of airway, breathing, circulation, level of consciousness and other life-threatening conditions.</p> <p>AC-C6 Differentiate the components of a secondary assessment to determine the type and severity of the injury or illness sustained.</p> <p>AC-C7 Identify the normal ranges for vital signs</p> <p>AC-C8 Describe pathological signs of acute/traumatic injury and illness including, but not limited to, skin temperature, skin color, skin moisture, pupil reaction, and neurovascular function.</p>
Wed. Feb. 13 th	On the Field Acute Care and Emergency Procedures: Emergency Action Plans	Chap. 10 Prentice NATA Position Statement Chap. 1-2 AAOS	<p>AC-C2 Describe the availability, content, purpose, and maintenance of contemporary first aid and emergency care equipment.</p> <p>AC-C3 Determine what emergency care supplies and equipment are necessary for circumstances in which the athletic trainer is the responsible first responder.</p> <p>AC-C4 Know and be able to use appropriately standard nomenclature of injuries and illnesses</p> <p>AD-P2 Develop risk management plans, including facility design, for safe and efficient health care facilities.</p>
Fri. Feb. 15 th	On the Field Acute Care and Emergency Procedures: Emergency Action Plans	Chap. 10 PRESENTATIONS	<p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <ul style="list-style-type: none"> a. Activate an emergency action plan <p>AD-C16 Identify and describe basic components of a comprehensive emergency plan for the care of acutely injured or ill patients, which include (1) emergency action plans for each setting or venue; (2) personnel education and rehearsal; (2) emergency care supplies and equipment appropriate for each venue; (3) availability of emergency care facilities; (4) communication with onsite personnel and notification of EMS; (5) the availability, capabilities, and policies of community-based emergency care facilities and community-based managed care systems; (6) transportation; (7)</p>

			<p>location of exit and evacuation routes; (8) activity or event coverage; and (9) record keeping.</p> <p>AD-C18 Identify components of a comprehensive risk management plan that addresses the issues of security, fire, electrical and equipment safety, emergency preparedness, and hazardous chemicals.</p>
<p>WEEK #6 Mon. Feb. 18th</p>	<p>On the Field Acute Care and Emergency Procedures: Patient Assessment</p>	<p>Chap. 3-4 AAOS, Chap. 3 AAOS CPR/PR</p>	<p>DI-C4 Explain directional terms and cardinal planes used to describe the body and the relationship of its parts</p> <p>DI-C6 Describe common techniques and procedures for evaluating common injuries including taking a history, inspection/observation, palpation, functional testing, special evaluation techniques, and neurological and circulatory tests</p> <p>DI-C10 Explain the roles of special tests in injury assessment</p> <p>DI-C16 Explain medical terminology and abbreviations necessary to communicate with physicians and other health professionals.</p> <p>DI-C17 Describe the components of medical documentation (e.g. SOAP, HIPS and HOPS)</p> <p>AC-C30 Identify information obtained during the examination to determine when to refer an injury or illness for further or immediate medical attention.</p> <p>AC- P1 Survey the scene to determine whether the area is safe and determine what may have happened.</p> <p>AC-P2 Perform an initial assessment to assess the following, but not limited to:</p> <ol style="list-style-type: none"> Airway Breathing Circulation Level of consciousness Other life threatening conditions
<p>Wed. Feb. 20th</p>	<p>On the Field Acute Care and Emergency Procedures: Patient Assessment LAB</p>		<p>DI-P2 Perform inspection/observation of the clinical signs associated with common injuries including deformity, posturing and guarding, edema/swelling, hemarthrosis, and discoloration</p> <p>MC-P2 Perform a visual observation of the clinical signs associated with common injuries and/or illnesses including deformity, edema/swelling, discoloration, and skin abnormalities.</p>

			MCP4c Pupil response, size and shape, and ocular motor function
Fri. Feb. 22 nd	Respiratory Conditions and Emergencies	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR	MC-C7 Describe and know when to refer common and significant respiratory infections, thoracic trauma, and lung disorders. (e.g., influenza, pneumonia, bronchitis, rhinitis, sinusitis, upper-respiratory infection (URI), pneumothorax, hemothorax, pneumomediastinum, exercise-induced bronchospasm, exercise-induced anaphylaxis, asthma). MC-C9 Describe the strategies for reducing the frequency and severity of asthma attacks.
WEEK #7 Mon. Feb. 25 th	Respiratory Conditions and Emergencies LAB	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR	AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: b. Establish and maintain an airway in an infant, child, and adult c. Establish and maintain an airway in a patient wearing shoulder pads, headgear or other protective equipment AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: e. Acute asthma attack
Wed. Feb. 27 th	Respiratory conditions, cont. CCTDI		
Fri. Feb. 29 th	CCTST	Meet in PHW 206 computer lab	
WEEK #8 Mon. March 3rd-Fri. March 7th	SPRING BREAK		
WEEK #9 Mon. March 10 th	Oxygen Administration	Chap. 6 AAOS CPR/PR PBL PROBLEM #1	AC-C11 Describe the role and function of supplemental oxygen administration as an adjunct to cardiopulmonary resuscitation techniques.
Wed. March 12 th	Cardiovascular Conditions	Chap. 5 AAOS, Chap. 4-5 AAOS CPR/PR PBL PROBLEM #1	MC-C10 Explain the possible causes of sudden death syndrome. MC-C11 Describe and know when to refer common cardiovascular and hematological medical conditions from trauma, deformity, acquired disease, conduction disorder, and drug abuse (e.g., coronary artery disease, hypertrophic cardiomyopathy, heart murmur, mitral valve prolapse, commotion cordis, Marfan's syndrome, peripheral embolism,

			hypertension, arrhythmogenic right ventricular dysplasia, Wolf-Parkinson-White syndrome, anemias, sickle cell anemia and sickle cell trait [including rhabdomyolysis], hemophilia, deep vein thrombosis, migraine headache, syncope).
Fri. March 14 th	Cardiovascular Conditions/Use of an AED	Chap. 6 AAOS, Chap. 4-5 AAOS CPR/PR PBL PROBLEM #1	RM-C7 Explain the importance for all personnel to maintain current certification in CPR, automated external defibrillator (AED) and first aid. AC-C10 Describe the role and function of an automated external defibrillator in the emergency management of acute heart failure and abnormal heart rhythms.
WEEK #10 Mon. March 17 th	Cardiac Emergencies LAB	PBL PROBLEM #1	AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: d. Perform one- and two-person CPR on an infant, child, and adult and/or with a suspected spine injury e. Utilize a bag-valve mask on an infant, child, and adult f. Utilize an automated external defibrillator (AED) according to current accepted practice protocols
Wed. March 19 th	TEST #2 Patient Assessment, Respiratory and Cardiovascular Conditions Test	PBL PROBLEM #1 DUE	
Fri. March 21 st	GOOD FRIDAY, No Classes		
WEEK #11 Mon. March 24 th	Bleeding and Shock	Chap. 7-9 AAOS PBL PROBLEM #2	AC-C13 Describe the proper management of external hemorrhage, including the location of pressure points, use of universal precautions, and proper disposal of biohazardous materials. AC-C14 Identify the signs and symptoms associated with internal hemorrhaging.
Wed. March 26 th	ASSESSMENT DAY, No Classes		

Fri. March 28 th	Bleeding Shock and	Chap. 7-9 AAOS PBL PROBLEM #2	<p>AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following:</p> <p>a. Different types of shock</p> <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p>f. Different types of shock</p>
WEEK #12 Mon. March 31 st	<p>Skin Conditions Poisoning/Bites and Stings LAB: Anaphylactic Shock</p>	Chap. 18-19 AAOS PBL PROBLEM #2	<p>MC-C15 Describe and know when to refer common and/or contagious skin lesions from trauma, infection, stress, drug reaction, and immune responses (e.g., wounds, bacteria lesions, fungal lesions, viral lesions, bites, acne, eczema dermatitis, ringworm).</p> <p>AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following:</p> <p>e. Allergic, thermal, and chemical reactions of the skin (including infestations and insect bites)</p> <p>AC-P3 Implement appropriate emergency treatment strategies, including but not limited to:</p> <p>i. Administer an EpiPen for anaphylactic shock</p> <p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p>l. Allergic, thermal, and chemical reactions of the skin (including infestations and insect bites)</p> <p>PH-C9 Identify medications that might cause possible poisoning, and describe how to activate and follow the locally established poison control protocols.</p> <p>PH-P3 Activate and effectively follow locally established poison control protocols.</p>
Wed. April 2 nd	Soft Tissue Injuries	Chap. 9, Chap. 11 AAOS PBL PROBLEM #2	<p>AC-C16 Describe the injuries and illnesses that require medical referral</p> <p>AC-C17 Explain the application principles of rest, cold application, elevation, and compression in the treatment of acute injuries</p> <p>AC-C18 Describe the signs, symptoms, and pathology of acute inflammation.</p> <p>AC-C33 Describe home care and self-treatment plans of acute injuries and illnesses.</p>

Fri. April 4 th	Musculoskeletal Injuries	Chap. 14 AAOS PBL PROBLEM #2 DUE	
WEEK #13 Mon. April 7 th	Injuries to the Extremities	Chap. 15 AAOS	AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: h. Acute musculoskeletal injuries (i.e. sprains, strains, fractures, dislocations)
Wed. April 9 th	WOUND CARE/SPLINTING LAB	Chap. 10, 16 AAOS PBL PROBLEM #3	AC-C15 Describe the appropriate use of aseptic or sterile techniques, approved sanitation methods, and universal precautions for the cleansing and dressing of wounds. AC-C31 Describe the proper immobilization techniques and select appropriate splinting material to stabilize the injured joint or limb and maintain distal circulation. AC-P3 Implement appropriate emergency treatment strategies, including but not limited to: h. Control bleeding using universal precautions AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: a. Open and closed wounds (using universal precautions)
Fri. April 11 th	Injuries to the Head, Neck and Back	Chap. 12 AAOS PBL PROBLEM #3	AC-C19 Identify the signs and symptoms of head trauma, including loss of consciousness, changes in standardized neurological function, cranial nerve assessment, and other symptoms that indicate underlying trauma. AC-C20 Explain the importance of monitoring a patient following a head injury, including obtaining clearance from a physician before further patient participation. AC-C21 Define cerebral concussion, list the signs and symptoms of concussions, identify the methods for determining the neurocognitive status of a patient who sustains a concussion and describe contemporary concepts for the management and return-to-participation of a patient who sustains a concussion. AC-C22 Identify the signs and symptoms of trauma to the cervical, thoracic and

			<p>lumbar spines, the spinal cord, and spinal nerve roots, including neurological signs, referred symptoms, and other symptoms that indicate underlying trauma and pathology.</p> <p>AC-C23 Describe cervical stabilization devices that are appropriate to the circumstances of an injury.</p> <p>AC-C24 Describe the indications, guidelines, proper techniques and necessary supplies for removing equipment and clothing in order to evaluate and/or stabilize the involved area.</p> <p>AC-C25 Describe the effective management, positioning, and immobilization of a patient with a suspected spinal cord injury.</p> <p>MC-C4 Describe and know when to refer common eye pathologies from trauma and/or localized infection (e.g., conjunctivitis, hyphema, corneal injury, stye, scleral trauma).</p> <p>MC-C5 Describe and know when refer common ear pathologies from trauma and/or localized infection (e.g., otitis, ruptured tympanic membrane, impacted cerumen).</p> <p>MC-C6 Describe and know when to refer common pathologies of the mouth, sinus, oropharynx, and nasopharynx from trauma and/or localized infection (e.g., gingivitis, sinusitis, laryngitis, tonsillitis, pharyngitis).</p> <p>MC-C17 Describe and know when to refer common neurological medical disorders from trauma, anoxia, drug toxicity, infection, and congenital malformation (e.g., concussion, postconcussion syndrome, second-impact syndrome, subdural and epidural hematoma, epilepsy, seizure, convulsion disorder, meningitis, spina bifida, cerebral palsy, chronic regional pain syndrome [CRPS], cerebral aneurysm).</p> <p>MC-C21 Describe and know when to refer common injuries or conditions of the teeth (e.g., fractures, dislocations, caries).</p>
WEEK #14 Mon. April 14 th	Injuries to the Head, Neck and Back	Chap. 12 AAOS PBL PROBLEM #3	<p>AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to:</p> <p>b. Closed-head trauma (using</p>

			standard neurological tests and tests for cranial nerve function) i. Spinal cord and peripheral nerve injuries
Wed. April 16 th	Injuries to the Chest, Abdomen and Pelvis	Chap. 13 AAOS PBL PROBLEM #3	AC-C12 Describe the characteristics of common life-threatening conditions that can occur either spontaneously or as the result of direct trauma to the throat, thorax and viscera, and identify the management of these conditions. MC-C12 Describe and know when to refer common medical conditions that affect the gastrointestinal and hepatic-biliary systems from trauma, chemical and drug irritation, local and systemic infections, psychological stress, and anatomic defects (e.g., hepatitis, pancreatitis, dyspepsia, gastroesophageal reflux, peptic ulcer, gastritis and gastroenteritis, inflammatory bowel disease, irritable bowel syndrome, appendicitis, sports hernia, hemorrhoids, splenomegaly, liver trauma). AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: g. Thoracic, respiratory, and internal abdominal injury or illness
Fri. April 18 th	Sudden Illness	Chap. 17 AAOS PBL PROBLEM #3 DUE	AC-C27 Identify the signs, symptoms, possible causes, and proper management of the following: b. Diabetic coma c. Seizures d. Toxic drug overdoses
WEEK #15 Mon. April 21 st	Sudden Illness	Chap. 17 AAOS PBL PROBLEM #4	AC-P4 Perform a secondary assessment and employ the appropriate management techniques for non-life-threatening situations, including but not limited to: d. Seizures j. Diabetic coma k. Toxic drug overdose
Wed. April 23 rd	Reaching and Moving Victims	Chap. 25 PBL PROBLEM #4	AC-C26 Identify the appropriate short-distance transportation method, including immobilization, for an injured patient. AC-C32 Describe the proper ambulatory aid and technique for the injury and patient.
Fri. April 25 th	Reaching and Moving Victims CCTDI	Chap. 25 PBL PROBLEM #4	AC-C26 Identify the appropriate short-distance transportation method, including immobilization, for an injured patient. AC-C32 Describe the proper ambulatory

			aid and technique for the injury and patient.
WEEK #16 Mon. April 28 th	CCTST	Meet in PHW 206 Computer Lab PBL PROBLEM #4	
Tues. April 29th	READING DAY	PBL PROBLEM #4 DUE	
Wed. April 30th 1:30-4:30 pm	DURING FINAL EXAM WEEK: TEST #3		

Appendix J

Surveys

Traditional Learning Self-Assessment Form

Please use the rating scale below to describe overall how you felt you performed on each of the tasks listed below as a result of participation in this course over the semester. This form will not be utilized in assigning grades, however it is beneficial for you and the instructor to reflect on progress that you have made throughout the semester as a result of participating in this class.

Part I: Effects on problem solving/critical thinking skills

1: Name:

Please write your answer here:

*** 2: I believe my problem solving skills were enhanced because of this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 3: I feel that this course taught me how to approach questions in a logical manner.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 4: I feel that I learned how to make logical decisions as a result of participating in this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 5: I learned how to defend my position (answers) as a result of this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 6: I learned how to critically evaluate information and not be too quick to jump to conclusions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 7: I feel that I was able to use knowledge gained in other courses to help me reach logical conclusions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 8: My ability to reach logical conclusions improved as a result of this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 9: I feel that my problem solving skills improved over the semester as a result of this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 10: I feel that my ability to think critically improved throughout this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 11: I do not feel that I learned how to solve problems better as a result of this course.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 12: Overall, I would enroll in another course taught in a traditional manner if given the opportunity.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

<http://kramer.gborocollege.edu/phpsurveyor/admin/printablesurvey.php...>

Submit Your Survey.

Thank you for completing this survey. Please fax your completed survey to: 217-7237.

Problem Based Learning Self-Assessment Form

Please use the rating scale below to describe overall how you felt you performed on each of the tasks listed below as a result of participation in the problem-based learning (PBL) process.

This form will not be utilized in assigning grades, however it is beneficial for you and the instructor to reflect on progress that you have made throughout the semester as a result of participating in PBL.

Part I: Preferences

* **1: Name:**

Please write your answer here:

* **2: I prefer lecture to problem based learning (PBL).**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **3: I enjoyed working on these problems more than listening to a lecture.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **4: I enjoyed taking the responsibility for my own learning.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **5: I learned more from the problems than I would have from lectures.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **6: I feel that PBL is a more effective method for learning than lecture.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 7: I feel that lecture from the instructor is a more effective way to learn complex ideas than PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 8: Although this was a new process for me, I liked this alternative method of learning more than lecture.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 9: I prefer learning in the traditional mode (lecture) as opposed to PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 10: I felt more anxious about having to seek out information for the problems than I did listening to a lecture.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 11: I feel that I would have learned more in a lecture setting than I did with PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

Part II: Benefits of PBL

*** 12: I have developed skills that will be invaluable to me in my academic career.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 13: I have developed skills that will be invaluable to me in my future career.**

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Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **14: I learned how to search for information (research articles, reference books, textbooks, etc.) outside of class.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **15: I learned where to search for accurate information.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **16: I learned how to decipher which websites are legitimate.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **17: My understanding of plagiarism improved as a result of these problems.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **18: My communications skills (oral) improved as a result of the PBL process.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **19: My communication skills (written) improved as a result of the PBL process.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **20: I will retain more information related to these medical conditions than I would have if I had listened to it in a lecture format.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

Part III: Motivation

* **21: The problems motivated me to study.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **22: The problems motivated me to learn.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **23: My attitude towards learning improved as a result of these problems.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **24: My drive to succeed was enhanced because of the motivation I had to find the answer to these problems.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **25: The problems motivated me to seek out additional information to find the answers that I was searching for.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

Part IV: Effects on problem solving/critical thinking skills

* **26: I believe my problem solving skills were enhanced because of PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **27: I feel that PBL taught me how to approach questions in a logical manner.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **28: I feel that PBL taught me how to make logical decisions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **29: I learned how to defend my position (answers) as a result of PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **30: I learned how to critically evaluate information and not be too quick to jump to conclusions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **31: I feel that I was able to use knowledge gained in other courses to help me reach logical conclusions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **32: My ability to reach logical conclusions improved as a result of PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree

<http://kramer.gborocollege.edu/phpsurveyor/admin/printablesurvey.php...>

- ☐ Disagree
☐ Strongly Disagree

*** 33: I feel that my problem solving skills improved over the semester as a result of PBL.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 34: I feel that my ability to think critically about the problems improved throughout this process.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 35: I do not feel that I learned how to solve problems better as a result of this process.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 36: Overall, I would enroll in another PBL course if given the opportunity.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

Submit Your Survey.

Thank you for completing this survey. Please fax your completed survey to: 217-7237.

PROBLEM BASED LEARNING TEAM ASSESSMENT FORM

Please use the rating scale below to describe overall how you felt your team performed on each of the tasks listed associated with your PBL group's activities. This information will not affect your grade in this course but will assist the instructor in understanding group cohesiveness and group participation.

Part I: Preferences for working with groups

1: Name:

Please write your answer here:

2: Team Members' Names:

Please write your answer here:

*** 3: I enjoyed working with other students in my group as opposed to working on my own.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 4: Group discussions helped me to make connections among ideas more than I would have been able to do on my own.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

*** 5: My group worked as an effective team.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree

☐ Strongly Disagree

*** 6: Our group worked in an efficient manner, more so than if I had worked on my own.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 7: I preferred working as a group on these assignments as opposed to working on my own.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 8: I preferred working independently on these assignments as opposed to working with my group.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

Part II: Group cohesiveness

*** 9: All members of my team contributed valuable information.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 10: Most members of my team contributed valuable information.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

*** 11: Members of my team completed assigned tasks on time.**

Please choose **only one** of the following:

- ☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

* **12: All members of my team participated in meetings outside of class.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **13: All members of my team were actively involved in seeking information to answer the problems.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **14: I felt other members of my group provided valuable contributions to our assignments.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **15: I felt that information presented by other students was unreliable.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **16: Each member of my group cooperated by contributing a fair amount of effort towards achieving our group's goals.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **17: I felt I could depend on other members of my group to complete tasks on time.**

Please choose **only one** of the following:

- ☐ Strongly Agree
 - ☐ Agree
 - ☐ Disagree
 - ☐ Strongly Disagree
-

* **18: The cooperation of each group member was imperative in forming a cohesive group.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

Part III: Perceptions of personal contributions to group

* **19: I was able to influence my group's decisions.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **20: I found it difficult to express my opinions in my group.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **21: I was able to make positive contributions to my group.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **22: It was difficult for me to generate discussions in my group.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

* **23: I felt my group received my ideas and information with interest.**

Please choose **only one** of the following:

- ☐ Strongly Agree
- ☐ Agree
- ☐ Disagree
- ☐ Strongly Disagree

Submit Your Survey.

Thank you for completing this survey. Please fax your completed survey to: 217-7237.

Appendix K

Raw Data from CCTDI #3 and CCTST #3 Subscales

Test_TakerID	Gender	Age	Year	Course	Major	TS	OM	Analy.	Syste.	CT SC	Inq.	CM	Total
59120	Female	19	So.	ATH 1100A	ESS	36.67	31.67	35.45	40.91	42.22	50.00	45.00	281.92
59125	Female	20	So.	ATH 1100A	ESS	36.67	36.67	37.27	33.64	40.00	35.00	32.00	251.24
59126	Male	19	Fr.	ATH 1100A	AT	35.83	30.83	36.36	37.27	35.56	39.00	32.00	246.86
59127	Male	19	Fr.	ATH 1100A	AT	36.67	45.00	49.09	44.55	45.56	52.00	45.00	317.86
59128	Female	19	Fr.	ATH 1100A	ESS	31.67	35.00	42.73	29.09	42.22	35.00	35.00	250.71
59129	Male	18	Fr.	ATH 1100B	ESS	35.83	39.17	50.91	40.00	45.56	41.00	45.00	297.46
59130	Male	19	Fr.	ATH 1100B	ESS	35.00	43.33	47.27	41.82	50.00	50.00	38.00	305.42
59134	Female	19	So.	ATH 1100B	AT	26.67	35.83	48.18	39.09	53.33	44.00	27.00	274.11
59135	Female	18	Fr.	ATH 1100B	AT	40.00	33.33	40.91	39.09	37.78	43.00	38.00	272.11
59138	Female	18	Fr.	ATH 1100B	AT	30.00	38.33	39.09	29.09	31.11	25.00	35.00	227.63
59140	Female	27	Se.	ATH 1100B	ESS	42.50	39.17	46.36	42.73	50.00	53.00	48.00	321.76
59141	Female	20	So.	ATH 1100B	AT	34.17	40.00	50.00	47.27	50.00	49.00	35.00	305.44
59145	Male	20	Fr.	ATH 1100B	AT	32.50	40.00	48.18	45.45	52.22	52.00	39.00	309.36
59146	Male	19	So.	ATH 1100B	ESS	39.17	54.17	54.55	37.27	56.67	59.00	50.00	350.82
59147	Female	18	Fr.	ATH 1100B	ESS	31.67	38.33	48.18	40.00	44.44	38.00	40.00	280.63
59149	Female	20	So.	ATH 1100B	AT	44.17	41.67	44.55	46.36	53.33	46.00	43.00	319.08
59151	Female	21	Se.	Control	ESS	23.33	37.50	45.45	31.82	46.67	45.00	31.00	260.77
59152	Female	21	Se.	Control	AT	32.50	40.00	51.82	43.64	51.11	42.00	44.00	305.07
59153	Female	21	Se.	Control	AT	27.50	39.17	46.36	39.09	50.00	50.00	35.00	287.12
59154	Male	21	Ju.	Control	AT	21.67	32.50	39.09	36.36	47.78	39.00	21.00	237.40
59155	Female	20	So.	Control	AT	35.83	34.17	36.36	28.18	42.22	40.00	39.00	255.77
59156	Female	22	Se.	Control	ESS	35.00	40.00	40.00	37.27	43.33	44.00	31.00	270.61
59157	Male	20	So.	Control	AT	32.50	35.83	38.18	34.55	42.22	35.00	35.00	253.28
59158	Female	21	Ju.	Control	Other	36.67	41.67	40.91	45.45	44.44	49.00	45.00	303.14
59159	Male	22	Ju.	Control	ESS	30.83	42.50	40.91	42.73	45.56	44.00	32.00	278.53
59487	Female	18	Fr.	ATH 1100A	ESS	30.00	45.00	40.91	27.27	45.56	40.00	30.00	258.74
59488	Female	18	Fr.	ATH 1100A	AT	26.67	40.83	47.27	47.27	52.22	41.00	34.00	289.27
59491	Male	22	Ju.	Control	ESS	33.33	43.33	40.91	33.64	47.78	51.00	36.00	285.99
59492	Female	21	Ju.	Control	AT	38.33	41.67	47.27	28.18	45.56	44.00	44.00	289.01
59520	Male	20	Fr.	ATH 1100A	AT	37.50	41.67	39.09	34.55	37.78	35.00	28.00	253.58
59521	Male	21	Ju.	ATH 1100A	ESS	35.83	40.00	45.45	44.55	44.44	42.00	31.00	283.28
59522	Female	19	So.	ATH 1100A	AT	26.67	35.00	50.91	40.00	45.56	52.00	30.00	280.13

Test_Take	Gender	Age	Education level	Course	Major	Ind.	Ded.	Ana.	Infer.	Eval.	TOTAL
59120	Female	19	Sophomore	ATH 1100A	ESS	8	6	2	9	3	14
59125	Female	20	Sophomore	ATH 1100A	ESS	6	6	5	5	2	12
59126	Male	19	Freshman	ATH 1100A	AT	9	4	4	7	2	13
59127	Male	19	Freshman	ATH 1100A	AT	9	6	4	6	5	15
59128	Female	19	Freshman	ATH 1100A	ESS	10	3	5	4	4	13
59129	Male	18	Freshman	ATH 1100B	ESS	14	8	5	9	8	22
59130	Male	19	Freshman	ATH 1100B	ESS	11	8	6	7	6	19
59134	Female	19	Sophomore	ATH 1100B	AT	5	3	3	3	2	8
59135	Female	18	Freshman	ATH 1100B	AT	5	6	4	4	3	11
59138	Female	18	Freshman	ATH 1100B	AT	8	6	5	6	3	14
59140	Female	27	Senior	ATH 1100B	ESS	12	10	6	11	5	22
59141	Female	20	Sophomore	ATH 1100B	AT	11	6	6	7	4	17
59145	Male	20	Freshman	ATH 1100B	AT	8	3	5	4	2	11
59146	Male	19	Sophomore	ATH 1100B	ESS	10	7	3	8	6	17
59147	Female	18	Freshman	ATH 1100B	ESS	14	9	4	12	7	23
59149	Female	20	Sophomore	ATH 1100B	AT	8	9	4	9	4	17
59151	Female	21	Senior	Control	ESS	9	6	4	9	2	15
59152	Female	21	Senior	Control	AT	13	8	6	9	6	21
59153	Female	21	Senior	Control	AT	10	7	6	7	4	17
59154	Male	21	Junior	Control	AT	2	5	2	4	1	7
59155	Female	20	Sophomore	Control	AT	7	3	2	5	3	10
59156	Female	22	Senior	Control	ESS	9	3	3	5	4	12
59157	Male	20	Sophomore	Control	AT	12	4	5	5	6	16
59158	Female	21	Junior	Control	Other	7	5	3	6	3	12
59159	Male	22	Junior	Control	ESS	5	2	1	4	2	7
59487	Female	18	Freshman	ATH 1100A	ESS	10	6	5	8	3	16
59488	Female	18	Freshman	ATH 1100A	AT	13	6	5	8	6	19
59491	Male	22	Junior	Control	ESS	10	5	3	7	5	15
59492	Female	21	Junior	Control	AT	8	8	5	5	6	16
59520	Male	20	Freshman	ATH 1100A	AT	10	5	4	7	4	15
59521	Male	21	Junior	ATH 1100A	ESS	15	11	6	13	7	26
59522	Female	19	Sophomore	ATH 1100A	AT	8	6	4	8	2	14